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BIOLOGICAL SURVEY OF STREAM OF COLES COUNTY, ILLINOIS 1967-1970

Leonard Durham, et al

Eastern Illinois University
Charleston, Illinois

June 1971

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Biological Survey of Stream of Coles County, Illinois 1967-1970

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27 Abstract
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Studies were made of the bottom fauna, plankton, and fishes in the streams. Physical and chemical characteristics such as pH, hardness, dissolved oxygen, turbidity, nitrites, nitrates, phosphates, sulfates, and carbon dioxide were also measured. These data are listed, relative abundance noted, and a brief discussion is included.

Portions of two fairly large rivers (Embarrass and Kaskaskia) are in Coles County. The remaining 18 streams range from good sized creeks to small headwater-type tributary streams. Eighty species of fishes are included in the Coles County list. This study includes a comparison of the present fish fauna with a study published in 1913 by T.H. Hankinson and one by Forbes & Richardson in 1920 in essentially the same streams.

This report was submitted in fulfillment of Project No. WP0114 (18050DZZ) under the sponsorship of the Water Quality Office, Environmental Protection Agency. Durham - Eastern Illinois

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BIOLOGICAL SURVEY OF STREAMS OF COLES COUNTY, ILLINOIS
1967-1970

by

Eastern Illinois University
Division of Life Sciences
Charleston, Illinois 61920

for the

ENVIRONMENTAL PROTECTION AGENCY

Project No. WP 0114
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Field and laboratory studies were carried out on 20 streams in Coles County, Illinois from 1967 through 1970. A large reservoir (Lincoln Lake) is planned by the Army Corps of Engineers and, if completed, will have considerable impact on Coles County. A record of existing conditions was desired in order to help determine the effects of the reservoir in the area.

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SECTION I

CONCLUSIONS

1. The streams of Coles County, Illinois contain a rich fauna. Eighty species of fishes, representing 18 families, were noted. Bottom fauna and plankton forms are also abundant. The moraines formed at the edge of the Wisconsin glaciation account in part for some of the diversity.

2. Some changes in the fish fauna have occurred in the past fifty to sixty years. Five species reported in the early studies were not found in the present study. The most notable species that were once abundant but which have disappeared are Hybopsis amblops and Hybopsis storeriana. Thirteen species were collected in the present study which were not reported in the earlier works. Many of these changes can be attributed to changes in land usage and greater siltation occurring in the streams.

3. Various types of pollution including silt, fertilizers, insecticides, herbicides, domestic sewage, industrial wastes, oil, and two occurrances of accidental spillage of materials from train wrecks, were encountered in this study. Many of these were of a sporadic nature (industrial wastes, oil, herbicides, fertilizers, insecticides, and accidental spillage). The use of agricultural field tiles by industries to get rid of plant effluents was noted as a problem. Some of the industries have corrected some of the problems, particularly through changes in processes, and not releasing heavy metals with their waste waters.

SECTION II

RECOMMENDATIONS

This project was undertaken in part, to record existing biological and physical conditions prior to the construction of a large reservoir in the area. A continuing study should be made as the reservoir develops and after its completion. In this manner, a more complete picture of the impact of the reservoir in the area can be had.

Pollution problems should be corrected. Soil stabilization structures or procedures should be developed on the entire watershed of the proposed reservoir. Enforcement of effluent standards and better control of the watershed usage hould be carried out. The use of agricultural drainage tile in industries for discharge of wastes should be prevented since these often receive untreated contaminants that end up in streams.

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SECTION III

INTRODUCTION

A biological survey of the streams of Coles County, Illinois was initiated in June, 1967 and was terminated in August, 1970. The purposes of the project were:

1. To determine the present species of fishes, macroinvertebrates, and plankton inhabiting the streams of Coles County, Illinois.

2. To determine the present environmental conditions in the streams with respect to pollutants (organic materials, silt loads, chemicals, and others) and other physical and chemical characteristics.

3. To compare the existing fish populations and environmental conditions with those present approximately 60 years ago as reported by Hankinson (1913).

The first two purposes will be useful as bases for comparing the effects of a proposed new Army Corps of Engineers reservoir (Lincoln Lake) which is to be built on the Embarrass River ten miles south of Charleston, Illinois just south of the Coles-Cumberland County Line. A good record of existing conditions, fauna, etc. will be invaluable in future studies of the region.

By comparing the present day species of fishes with those recorded 60 years ago, some insight might be gained with respect to the causes of any changes that have occurred. There have been increased human population, greater industrial emphasis, and many changes in agricultural practices in the county since that time.

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SECTION IV

METHODS AND MATERIALS

Twenty streams in Coles County were selected as suitable for study. Permanent study stations were established on the streams; the number of stations varying with the length of the stream. The 77 stations established are listed, located, and described by stream in Appendix A.

Attempts were made initially to randomly assign the stations using a grid system and drawing the location "from the hat" prior to field selection. Too many problems arose from this method, so that a majority of the stations were selected on the basis of access, distance from other stations, and representative characteristics.

Samples taken from each station consisted of fishes, bottom organisms, plankton, and a water sample for chemical and physical analysis. Water and air temperature, dissolved oxygen, and pH (electrometric) were measured in the field. Other chemical analyses of the water samples were done in the laboratory. The tests included the following:

Nitrates - Cadmium reduction method - Standard Methods, 12th Ed., page 395.
Nitrites - Diazotization method, - Standard Methods, 12th Ed., page 400.
Phosphates - Ortho, and Meta (or Poly) Stanna Ver method, Standard Methods, 12th Ed., page 234.
Sulfates - Turbimetric method, Standard Methods, 12th Ed., page 291.
Carbon dioxide - Titrimetric method, Standard Methods, 12th Ed., page 82.
Calcium Hardness - EDTA Titrimetric method, Standard Methods, 12th Ed., Page 147.
Total Hardness - same as Calcium Hardness.
Biochemical Oxygen Demand, (B.O.D.) - 5-Day Incubation Technique, Standard Methods, 12th Ed., page 415.

Dissolved Oxygen was measured with a Y.S.I. Oxygen Meter, Model 53. The results of this instrument were checked periodically against the Azide Modification of the Iodometric method (Winkler). Such parallel results showed the Meter to be quite reliable.

The water samples were taken utilizing a Water and Sewage Sampler, as specified by the American Public Health Association, allowing for a triple over-flow of sample. Where sampling methods were not critical, liter grab samples were taken. The water quality tests were run immediately after returning to the laboratory. Several tests were made on site, including pH, dissolved oxygen and temperature.

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Each station was sampled as frequently as time permitted, but usually all stations were sampled in any stream system before repeating any of them. Since the Embarrass River water shed will be the area affected by the proposed reservoir, greater emphasis was placed in that area. The lower Embarrass River had been the subject of detailed studies of the fish population for three years prior to this study. Thus fewer stations were established on this part of the river.

Fish sampling was done by means of seines (10 feet and 20 feet long) and electrofishing (115 volt and 230 volt generators used). One hundred yards of stream were shocked and/or seined at each station. The fishes were preserved in the field and later sorted by species, counted, weighed and measured. The smaller fishes (minnows, etc.) were weighed in groups with range in lengths and average length recorded. A Mettler top loading balance, accurate to 0.1 gram, was used for determining the weights of the fishes. Species identification was done using a variety of keys (Trautman, 1957; Hubbs & Lagler, 1964; and others). Dr. Philip W. Smith of the Illinois Natural History Survey verified or corrected many of the identifications.

The invertebrates were sampled by a number of methods. Plankton was collected by a standard 25-mesh net. Thirty liters were concentrated to 20 ml for counting. Population counts were determined after Welch utilizing a Sedgwick-Rafter cell counting 30 fields. Cursory identifications were made of protozoans and other microscopic forms.

The qualitive benthic forms were collected by Ekman and Jackson Dredges, as well as by cruising with a dip net. Materials were sorted through a set of standard sieves, preserved and identified using several available manuals. Taxonomic level of classification was determined by the complexity of the taxonomy of the group involved.

No attempts were made to identify the types of algae encountered other than to place them in broad groups such as blue-green, diatoms, etc.

SECTION V

DESCRIPTION OF COLES COUNTY

Coles County is located in east central Illinois. It is bordered by Edgar and Clark Counties on the east, Cumberland County on the south, Shelby County on the west and Douglas County on the north. The population of the County (1970 census) is approximately 48,500. The two principle cities are Mattoon (pop. 19,500) and Charleston (pop. 16,500).

A number of industries are located in the county, particularly in Mattoon and Charleston. These include a variety of manufacturing and processing plants. Most of these are relatively recent acquisitions to the area.

At the present time about 30% of the land is in cutover forests. Most of the rest is cultivated, although many fields are being abandoned and are reverting back to forests. Also, some areas are being planted in pines. Present vegetation studies show that the composition does not differ greatly from the original vegetation that once existed (Ebinger, Unpublished).

The Wisconsin glaciation extended southward and westward to a position along a line from Paris, Illinois, through Charleston, Mattoon, Shelbyville, Decatur, and Peoria. The glacial drift deposited at this position of the ice front formed a series of ridges which is now called the Shelbyville moraine. This moraine lies immediately to the south of Charleston. It is composed of a complex of three ridges extending in a general east-west direction interlaced by several small ridges running north-south between the major formations.

To the north of the moraine is a moderately undulating plain made up of material laid down as the ice sheet retreated during a moderate period in the Pleistocene climate. This retreat was rapid to a position about 10 miles north of Charleston and its pause there resulted in the formation of a ridge which stands 20 to 30 feet above the surrounding plain (part of the Cerro Gordo moraine).

The stream systems of the county are directly related to these glacial deposits. The Embarrass, Hurricane, and Little Wabash systems are associated chiefly with the rough, hilly country and their light-colored soil and patches of timber. The Kaskaskia system is associated with the level, black soil prairie.

DRAINAGE SYSTEMS

Coles County is drained by two major rivers - the Embarrass and Kaskaskia, both of which originate in Champaign County. The Embarrass passes due south through the entire length of the county and thus receives the major portion of the run-off. It empties into the Wabash River near Vincennes, Indiana. The Kaskaskia, on the other hand, flowing in a southwesterly direction, drains only the northwest portion of the county. It eventually flows into the Mississippi River in Randolph County, near Chester, Illinois.

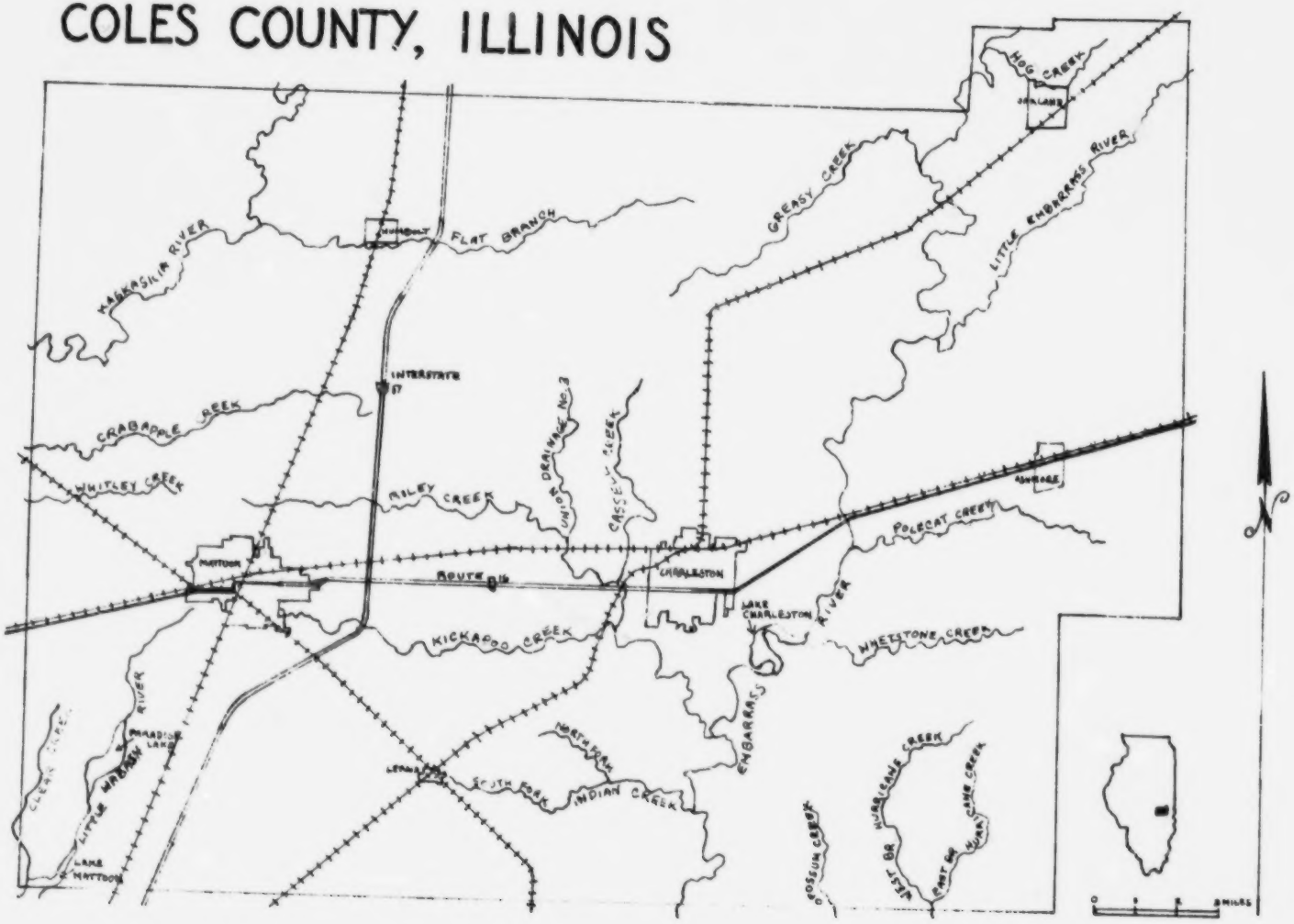
The streams draining into the Embarrass within the county limits are: Kickapoo Creek, Indian Creek, Riley Creek, Union Drainage #3, Cassell Creek, Greasy Creek, Hog Creek, Little Embarrass River (occasionally known as Brush Creek), Polecat Creek, Rattlesnake Creek, and Whetstone Creek. Two other streams, with headwaters in Coles County, enter the Embarrass River farther downstream. These are Hurricane Creek (East and West Branches), and Opossum Creek. These enter the Embarrass in Cumberland County.

The Kaskaskia River drainage includes the following additional streams in Coles County: Flat Branch, Crabapple Creek, and Whitley Creek.

The headwaters of the Little Wabash River are located west and south of Mattoon, Illinois, along with Clear Creek which flows into the Little Wabash. Both Lake Mattoon and Paradise Lake are associated with the Little Wabash. The Little Wabash empties into the Wabash River near the Gallatin County-White County boundary.

For purposes of description and separation, the followin drainage systems are included in the annotated list descriptions: Embarrass, Kaskaskia, Hurricane, and Little Wabash systems.

COLES COUNTY, ILLINOIS



SECTION VI

ANNOTATED LIST OF FISHES

Eighty species from 18 families are included in our listing of the stream fishes of Coles County, Illinois (Table 1). These represents only those taken during the course of our own studies, or, in one instance, on the basis of a recent detailed description of Hiodon alosoides by an experienced fisherman.

In comparing our list with that of Hankinson (1913) and Forbes & Richardson (1920), the synonomy is indicated in parentheses after the common name. Much of the determination of synonomy was arrived at by using Larimore & Smith (1963) and verbally with Dr. Philip W. Smith of the Illinois Natural History Survey. The order of listing of the families is that followed in the American Fisheries Society, Special Publication No. 6 (1970).

Petromyzontidae

Ichthyomyzon castaneus Girard - Chestnut Lamprey - Three specimens taken from the Embarrass River below Lake Charleston. One specimen was collected from the mouth of the Kickapoo Creek by a fisherman while the lamprey was attached to a carp. Not found in the other drainage systems of the county. Not reported by Hankinson or Forbes & Richardson.

Lampetra lamottei (Le Sueur) - American Brook Lamprey - collected only from Embarrass River, usually in sandy or lightly silted areas. Hundreds were collected during a serious fish kill in the river in 1963. Not reported by Hankinson or Forbes & Richardson.

Polyodontidae

Polyodon spathula (Walbaum) - Paddlefish - one specimen weighing 2.8 pounds, measuring 32 inches collected by seine haul below Lake Charleston dam in 1970, at night. Only record of it.

Lepisosteidae

Lepisosteus osseus (Linneaus) - Longnose gar - Thirty-one specimens collected from Embarrass River and Kaskaskia River. Not common. Forbes & Richardson recorded it from Kaskaskia River in Coles County.

Lepisosteus platostomus (Rafinesque) - Shortnose gar- One taken from Embarrass River. Not collected by Hankinson, but was on his hypothetical list. Not recorded by Forbes & Richardson.

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Amiidae

Amia calva (Linnaeus) - Bowfin - Only three specimens collected from Embarrass River. None in smaller streams. Sporadically caught by fishermen below Lake Charleston. Reported by Hankinson, but not by Forbes & Richardson.

Anguillidae

Anguilla rostrata (Le Sueur) American eel -(Anguilla chrysypa)- Three specimens verified from Embarrass River below Lake Charleston. Listed by Hankinson in hypothetical list.

Clupeidae

Dorosoma cepedianum (Le Sueur) - Gizzard shad - Present in most streams of the county except the smaller ones. Not definitely collected by Hankinson, but presence in Embarrass was indicated by fishermen at that time. Forbes & Richardson reported it from Kaskaskia River.

Hiodontidae

Hiodon alosoides (Rafinesque) - Goldeye - One report from an experienced fisherman of a fish fitting description from Embarrass River below Lake Charleston. Listed by Hankinson on hypothetical list; not recorded by Forbes & Richardson.

Esocidae

Esox americanus vermiculatus Le Sueur - Grass pickerel - (Esox vermiculatus)- collected in eleven of the 20 streams studied, including the largest and clearest streams of all drainage systems except Hurricane Creek. Hankinson recorded it only from Embarrass River. Forbes & Richardson reported it from the Kaskaskia only in Coles County.

Cyprinidae

Campostoma anomalum (Agassiz) - Central Stoneroller - Found in all but three of the streams studied (not in Flat Branch, Whitley Creek, and Little Wabash). Hankinson considered it abundant in Embarrass system, did not find it in Kaskaskia system. Also Forbes & Richardson.

Cyprinus carpio (Linnaeus) - carp - Found in all drainage systems except Hurricane Creek system. In larger streams, usually. Hankinson indicated records for only the Embarrass and Kaskaskia Rivers.

Ericymba buccata (Cope) - Silverjaw minnow. Found in all but six of the twenty streams studied. (Not collected in Riley, Hog, Kaskaskia, Crabapple, Whitley and Little Wabash.) Only four specimens from the Kaskaskia drainage (Flat Branch). Very common and predominant in Embarrass system and Hurricane system. Hankinson found it abundant in both Embarrass and Kaskaskia systems as did Forbes & Richardson.

Hybognathus nuchalis nuchalis (Agassiz) - Western silvery minnow - Found only in Kaskaskia system in Coles County. Reported by Hankinson as very scarce in Embarrass system, while very abundant in the Kaskaskia system in small creeks. From Kaskaskia River by Forbes & Richardson.

Hybopsis storeriana (Kirtland) - Silver Chub - Reported from Embarrass River during fish kill in 1963. None collected in county since then. Reported by Hankinson as abundant in Embarrass and often caught on worm-baited hooks. Same reported by fishermen up to 1942. Not reported by Forbes & Richardson.

Nocomis biguttata (Kirtland) - Hornyhead chub - (Hybopsis kentuckiensis). Collected in this study only from Flat Branch. Hankinson considered it abundant in Kaskaskia system and collected only two specimens from Embarrass system (Polecat Creek). Forbes & Richardson reported it from Kaskaskia system. Reported from Polecat Creek in unpublished paper by Philip Smith, 1940.

Notemigonus crysoleucas (Mitchell) - Golden shiner - (Abramis crysoleucas). Rare in Embarrass drainage except in Polecat and Hog Creeks. Common in Kaskaskia system. Considered uncommon by Hankinson. Reported in Embarrass and Kaskaskia by Forbes & Richardson.

Notropis atherinoides atherinoides (Rafinesque) - Emerald shiner - Collected only from Embarrass and Little Embarrass Rivers, few specimens. Hankinson reported it on occasion from Embarrass River and Kickapoo Creek. Forbes & Richardson indicated it from Embarrass River.

Notropis boops (Gilbert) - Bigeye shiner -(Notropis illecebrosus) Rare: One specimen taken from Embarrass River. Was common in Hankinson's time in Embarrass River and larger tributaries. Reported by Forbes & Richardson from Embarrass River.

Notropis chrysocephalus (Rafinesque) - Striped shiner - Notropis cornutus). Present in all streams of Embarrass system except Riley and Hog Creeks, and in Kaskaskia system

except Whitley Creek. Not found in Little Wabash system in Coles County. Considered uncommon except in Polecat and Crabapple Creeks by Hankinson. Recorded by Forbes & Richardson in Embarrass and Kaskaskia.

Notropis lutrensis (Baird and Girard) - Red shiner - Common in Kaskaskia system. One reported from Little Embarrass River, but is a probable misidentification. Considered rare by Hankinson, with only three specimens recorded (two from Flat Branch, one from Crabapple Creek). None by Forbes & Richardson.

Notropis spilopterus (Cope) - Spotfin shiner - (included in N. whipplii of Hankinson and Forbes & Richardson). Present in all systems in the county.

Notropis stramineus (Cope) - Sand shiner - (N. blennius, recently N. deliciosus). Found in all drainage systems in county. Not found by Hankinson and Forbes & Richardson in Kaskaskia system.

Notropis umbratilis cyanocephalus (Copeland) - Redfin shiner - (N. umbratilis atripes). Found abundant in all streams in county except Clear Creek where it was not found. Abundant in Hankinson's study; also Forbes & Richardson.

Notropis whipplei (Girard) - Steelcolor shiner -(N. whipplii) Found in all systems except Kaskaskia. Probably combined with N. spilopterus by Hankinson who reported it abundant at all times in larger rivers and creeks. Also by Forbes & Richardson.

Phenacobius mirabilis (Girard) - Suckermouth minnow - In all drainages except Little Wabash. Only four found in Kaskaskia system (Flat Branch). Found in Embarrass and Kaskaskia systems by Hankinson and Forbes & Richardson.

Pimephales notatus (Rafinesque) - Bluntnose minnow - All streams except those in Little Wabash system. Very abundant in most collections. Considered by Hankinson as the best represented fish in numbers of individuals. May be the present situation also. Well represented throughout county by Forbes & Richardson.

Pimephales promelas promelas (Rafinesque) - Northern fathead minnow - Not collected in Hurricane and Little Wabash systems. Present to greatest numbers in the smaller streams. Hankinson did not report it from Kaskaskia system, nor did Forbes & Richardson.

Pimephales vigilax perspicuus (Girard) - Northern bullhead minnow - Cliola vigilax). Found in only four streams in the county (Embarrass, Polecat, Kickapoo and Union Drainage #3), but mainly in the Embarrass. Reported by Hankinson as common in the Kaskaskia, but not found by us. From Kaskaskia and Embarrass systems by Forbes & Richardson.

Semotilus atromaculatus atromaculatus (Mitchell) - Northern creek chub - Found in all drainage systems. Prefers smaller streams. Similar records by Hankinson. Recorded by Forbes & Richardson from Embarrass system only.

Catostomidae

Carpiodes carpio (Rafinesque) - River carpsucker - Found only in Embarrass River and West Branch of Hurricane Creek in this study. Not reported by Hankinson or Forbes & Richardson.

Carpiodes cyprinus hinei - (Trautman) - Central quillback carpsucker - (Carpiodes velifer). Collected only from Embarrass drainage system. Hankinson reported it from Kaskaskia. No report of it in county by Forbes & Richardson.

Carpiodes velifer (Rafinesque) - Highfin carpsucker. (Carpiodes difformis). Collected only from Embarrass River (28 specimens). Hankinson reported it from Embarrass River and Kickapoo Creek. Forbes & Richardson included the Kaskaskia River.

Catostomus commersoni commersoni (Lacepede) - White sucker (C. commersonii). In all drainages. Reported as common by Hankinson. Reported by Forbes & Richardson in Embarrass.

Erimyzon oblongus claviformis (Girard) - Western creek chubsucker - (E. sucetta oblongus). Found in all our streams except Polecat Creek and Little Wabash. More common in smaller streams as reported by Hankinson. Also common in Forbes & Richardson collections here.

Hypentelium nigricans (Le Sueur) - Northern hog sucker - (Catostomus nigricans). Found only in Embarrass and Hurricane systems. Reported as common by Hankinson, and in Kaskaskia drainage by Forbes & Richardson.

Ictiobus bubalus (Rafinesque) - Smallmouth buffalo - Two specimens taken from Embarrass River and one from Kaskaskia River. Was on hypothetical list of Hankinson. Not reported by Forbes & Richardson.

Ictiobus cyprinellus (Valenciennes) - Bigmouth buffalo - Three specimens from Embarrass River. Was on Hankinson's hypothetical list, but not recorded by Forbes & Richardson.

Ictiobus niger (Rafinesque) - Black buffalo - (Ictiobus urus) One specimen from Embarrass River. On hypothetical list of Hankinson; not reported by Forbes & Richardson.

Minytrema melanops (Rafinesque) - Spotted sucker - Found only in Embarrass drainage now. Hankinson indicated it was common in the Kaskaskia, scarce in the Embarrass system. Reported in both by Forbes & Richardson.

Moxostoma anisurum (Rafinesque) - Silver redhorse - Taken in five streams (Embarrass - 99, one each from Polecat Creek, Little Embarrass, Union Drainage and Cassell.) On Hankinson's hypothetical list, not recorded by Forbes & Richardson.

Moxostoma erythrurum (Rafinesque) - Golden redhorse - (M. aureolum). In all drainages and abundant. Apparently not much change since Hankinson's and Forbes & Richardson's time.

Moxostoma macrolepidotum (Le Sueur) - Northern redhorse - (M. breviceps and until fairly recently called M. aureolum). Found in three streams of Embarrass system. (Embarrass, Kickapoo, and Little Embarrass). Uncommon by Hankinson. Reported in Kaskaskia by Forbes & Richardson.

Ictaluridae

Ictaluris melas (Rafinesque) - Black bullhead - (Ameiurus melas). In all drainages. Similar to Hankinson's findings. Recorded from Kaskaskia system only by Forbes & Richardson.

Ictaluris natalis (Le Sueur) - Yellow bullhead - (Ameiurus natalis). In all drainages. Apparently abundant in Hankinson's and Forbes & Richardson's time.

Ictaluris punctatus (Rafinesque) - Channel catfish - Found only in Embarrass River and Kickapoo Creek. Fished for locally. Reported from Kaskaskia by Forbes & Richardson.

Noturus exilis (Nelson) - Slender madtom - (Schilbeodes exilis) Probable misidentification of one specimen from Embarrass River. Hankinson reported one specimen from Kaskaskia River.

Noturus gyrinus (Mitchell) - Tadpole madtom - (Schilbeodes gyrinus). Found only in Kaskaskia River and Flat Branch by

us. Not common. Hankinson and Forbes & Richardson indicated similar findings.

Noturus miurus (Jordan) - Brindled madtom -(Schilbeodes miurus). Most abundant in Kaskaskia River, Polecat Creek, and Little Embarrass. Relatively few from Greasy Creek and Kaskaskia River. In night time collections, common. Hankinson found it only in Embarrass system; Forbes & Richardson also.

Noturus nocturnus (Jordan and Gilbert) - Freckled madtom - (Schilbeodes nocturnus). Taken by us from Embarrass River, Kaskaskia River and Flat Branch. Rare. Hankinson reported it from Kickapoo Creek, Kaskaskia and Flat Branch. None by Forbes & Richardson.

Pylodictis olivaris (Rafinesque) - Flathead catfish - (Leptops olivaris). Only from Embarrass River by us. Hankinson included the Kaskaskia also. Not reported by Forbes & Richardson.

Aphredoderidae

Aphredoderus sayanus (Gilliams)- Pirate perch - From Embarrass and Kaskaskia systems. Largest collection from Polecat Creek (24). Hankinson reported it from Kaskaskia system; also Forbes & Richardson.

Cyprinodontidae

Fundulus notatus (Rafinesque) - Blackstripe topminnow - Found in all drainages and in all but three of the streams studied (Whetstone, Indian, and Whitley Creeks). Reported as common by Hankinson and Forbes & Richardson.

Atherinidae

Labidesthes sicculus (Cope) - Brook silversides - Found in Embarrass system (5 larger streams). Found by Hankinson and Forbes & Richardson only in Embarrass River.

Serranidae

Roccus mississippiensis (Jordan and Eigenmann) - Yellow bass - Found only in the Embarrass River by us. Probably from Lake Charleston where it is fairly abundant. Not reported by Hankinson nor Forbes & Richardson.

Centrarchidae

Ambloplites rupestris rupestris (Rafinesque) - Northern Rock bass - Embarrass and Kaskaskia Rivers only. Reported by

Hankinson as also in larger tributaries of the Embarrass. Forbes & Richardson reported it for the Kaskaskia River.

Chaenobryttus gulosus (Cuvier) - Warmouth - occasionally taken in Embarrass River. One specimen from Hog Creek which flows through Lake Oakland. Hankinson speculated on its occurrence based on fishermen reports from Embarrass River. Forbes & Richardson reported from the Kaskaskia River in Coles County.

Lepomis cyanellus Rafinesque - Green sunfish - Found in all streams studied. Hankinson described it as the most widely distributed of any species of fish in the region.

Leponis humilis (Girard) - Orangespotted sunfish - Found in Embarrass River, Hog Creek, Flat Branch, and Little Wabash. Hankinson reported it from Flat Branch and Kaskaskia; also Forbes & Richardson.

Lepomis macrochirus macrochirus Rafinesque - Northern bluegill - (Lepomis pallidus). Found in all streams except Riley and Indian Creeks. Hankinson reported only one specimen collected (Kickapoo Creek). Forbes & Richardson reported it from Kaskaskia.

Lepomis megalotis megalotis (Rafinesque) - Central longear sunfish - In all streams except Indian, Hog, Opossum and Whitley Creeks (the smaller creeks). Hankinson reported a similar distribution. Also common by Forbes & Richardson.

Micropterus dolomieui dolomieui Lacepede - Northern smallmouth bass (M. dolomieu) - Taken on eleven occasions from Embarrass River; one report from Kickapoo Creek (near mouth). Hankinson reported it in Polecat Creek in addition to above two streams. Forbes & Richardson reported it only from the Embarrass River.

Micropterus punctulatus punctulatus (Rafinesque) - spotted bass - (Included in Micropterus salmoides composite of early authors). Found in all streams of Embarrass system except Riley and Opossum Creeks. Also found in all other systems. Most common of the genus Micropterus in Coles County streams.

Micropterus salmoides salmoides (Lacepede) - Northern largemouth bass - Taken in all drainages. Not abundant in any of the streams. Hankinson, including the spotted bass with the large-mouth, understandably considered it abundant, as did Forbes & Richardson.

Pomoxis annularis Rafinesque - White crappie - Present in those streams associated with a lake or reservoir, or with

natural deep pools (Embarrass River, Polecat, Kickapoo, and Hog Creeks, Little Wabash, Clear Creek, and Flat Branch). Hankinson reported it from the Embarrass and Little Wabash. Not reported in Coles County by Forbes & Richardson.

Pomoxis nigromaculatus (Le Sueur) - Black crappie - (Pomoxis sparoides). Collected only from Embarrass River (3 specimens). It is more abundant in Lake Charleston. Hankinson reported it only from Mattoon reservoir (Lake Paradise). Not reported here by Forbes & Richardson.

Percidae

Ammocrypta pellucida (Baird) - Eastern sand darter - Collected only from Embarrass River. Similar reports by Hankinson and Forbes & Richardson.

Etheostoma asprigene (Forbes) - Mud darter - (E. Jessiae). Embarrass River only. Hankinson reported it also from Kaskaskia (one specimen). Also by Forbes & Richardson. Reported from Kaskaskia River backwater near Chesterville by Philip W. Smith in unpublished paper (1940).

Etheostoma blennioides Rafinesque - Greenside darter - (Diplesion blennioides). From Embarrass and Hurricane drainages (includes Embarrass River, Polecat Creek, Little Embarrass River, and Hurricane, West Branch). Hankinson reported it from Embarrass River and its larger tributaries. Also Forbes & Richardson.

Etheostoma caeruleum Storer - Rainbow darter - (E. coeruleum) Found in parts of Embarrass River and five tributaries (Kickapoo, Polecat, Indian, and Greasy Creeks, Little Embarrass) plus Kaskaskia River and Hurricane, West Branch. Hankinson and Forbes & Richardson found it only in Embarrass system in Coles County.

Etheostoma flabellare flabellare (Rafinesque) - Fantail darter - From Embarrass River, Kickapoo Creek, Union Drainage, and Polecat Creek only. Similar reports by Hankinson and Forbes & Richardson.

Etheostoma gracile (Girard) - Slough darter -(Boleichthys fusiformis). One specimen from Embarrass River. Same report by Hankinson. No other reports of it.

Etheostoma nigrum nigrum (Rafinesque) - Eastern Johnny darter - (Boleosoma nigrum). All drainages, found in all streams except Opossum, Whitley, and Clear Creeks. Reported as abundant by Hankinson and Forbes & Richardson

Etheostoma spectabile spectabile (Agassiz) - Northern orange-throat darter - (Probably included in E. caeruleum of Hankinson and early workers). Collected by us in all drainages except Kaskaskia.

Percina caprodes caprodes (Rafinesque) - Log Perch- Collected in Embarrass and Little Embarrass Rivers, and Polecat Creek of the Embarrass system, and the Kaskaskia River. Similar report by Hankinson. In Kaskaskia by Forbes & Richardson.

Percina maculata (Girard) - Blackside darter -(Hadropterus aspro). Embarrass and Kaskaskia drainages. Same findings by Hankinson and Forbes & Richardson.

Percina phoxocephala (Nelson). Slenderhead darter (Hadropterus phoxocephalus). Fairly common in Embarrass and Kaskaskia rivers, not taken elsewhere. Same report by Hankinson. Recorded by Forbes & Richardson from Embarrass and Kaskaskia systems.

Percina sciera sciera (Swain). Northern dusky darter - (Hadropterus sciurus). Embarrass River (154 specimens) and Kickapoo Creek (9 specimens). Hankinson reported 2 specimens from Embarrass River.

Stizostedion canadense (Smith) - Sauger - Three specimens from Embarrass River; other reports by fishermen of which two were verified by author. Reported by Forbes & Richardson from Kaskaskia River in Coles County, near western border.

Sciaenidae

Aplodinotus grunniens Rafinesque - Freshwater drum - Twelve specimens collected from Embarrass River. No other streams represented. Not reported by Hankinson nor Forbes & Richardson.

SECTION VII

FISHES RECORDED BY HANKINSON, BUT NOT COLLECTED IN THIS STUDY

Five species of fishes were reported by Hankinson which were not encountered in the present study nor in casual records maintained by us prior to the study. These are:

Notropis heterolepis Eigenmann & Eigenmann -(N. cayuga) - Based on report of Forbes & Richardson only from Embarrass system.

Notropis hudsonius (Clinton) - Spottail shiner - one specimen collected by Hankinson from Crabapple Creek near Coles, Illinois.

Hybobsis x-punctata Hubbs & Crowe - Gravel chub (Hybopsis dissimilis) - reported by Forbes & Richardson only (one specimen from upper Embarrass River).

Hybopsis amblops amblops (Rafinesque) - Northern bigeye chub - Reported as quite common in Embarrass and Kaskaskia and larger tributaries by Hankinson. Apparently has disappeared from Coles County.

Etheostoma chlorosomum (Hay) - Bluntnose darter - (Boleosoma camurum). One specimen collected from Kaskaskia by Hankinson. Forbes & Richardson apparently collected it near the Coles-Douglas boundary in Kaskaskia.

SECTION VIII

ANALYSIS OF FISH DISTRIBUTION IN COLES COUNTY

Of the 80 species of fishes found in the streams of Coles County, only 18 were collected from all four of the drainage systems. Thirty four species were found to occur only in the Embarrass drainage. Four additional species were found only in the Kaskaskia drainage. Neither Hurricane nor Little Wabash drainages had unique species.

Emphasis during this study was placed on the Embarrass system, due to the great length of it in Coles County and because it will be the main system affected by the advent of Lincoln Lake. Only a small portion of the Kaskaskia River occurs in Coles County and its local tributaries are relatively small. Thus, any comparison of the Kaskaskia fish fauna with that of the Embarrass would have to take this into consideration. A number of species, found by us only in the Embarrass drainage system, undoubtedly occur also in the Kaskaskia. Table 1. indicates the occurrence by stream of each species collected.

The following listing of 18 species includes those fishes which were found in all four of the drainage systems:

Catostomus commersoni
Erimyzon oblongus
Moxostoma erythrurum
Campostoma anomalum
Ericymba buccata
Notropis spilopterus
Notropis stramineus
Notropis umbratilis
Semotilus atromaculatus
Ictalurus melas
Ictalurus natalis
Fundulus notatus
Lepomis cyanellus
Lepomis macrochirus
Lepomis megalotis
Micropterus punctulatus
Micropterus salmoides
Etheostoma nigrum

(C. anomalum, N. spilopterus, & M. punctulatus rare in Kaskaskia drainage; M. salmoides not abundant in any drainage).

Fishes found only in the Embarrass drainage system:

Ichthyomyzon castaneus
Lampetra lamottei
Polyodon spathula
Lepisosteus platostomus
Amia calva
Hiodon alosoides
Carpiodes cyprinus
Carpiodes velifer
Ictiobus cyprinellus
Ictiobus niger
Ictalurus punctatus
Noturus exilis
Pylodictis olivaris
Anguilla rostrata
Labidesthes sicculus
Roccus mississippiensis
Chaenobryttus gulosus
Micropterus dolomieui
Pomoxis nigromaculatus
Ammocrypta pellucida

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Minytrema melanops
Moxostoma anisurum
Moxostoma macrolepidotum
Hybopsis storeriana
Notropis atherinoides
Notropis boops
Pimephales vigilax
Etheostoma asprigene
Etheostoma flabellare
Etheostoma blennioides
Etheostoma gracile
Percina sciera
Stizostedion canadense
Aplodinotus grunniens

Fishes found only in the Kaskaskia Drainage system:

Hybognathus nuchalis
Nocomis biguttata
Notropis lutrensis
Noturus gyrinus

Fishes occurring in the Embarrass & Kaskaskia systems only:

Ictiobus bubalus
Notemigonus crysoleucas
Pimephales promelas
Noturus miurus
Noturus nocturnus
Aphredoderus sayanus
Ambloplites rupestris
Percina maculata
Percina phoxocephala
Percina caprodes

Fishes occurring in Embarrass & Hurricane drainages only:

Hypentelium nigricans
Carpiodes carpio

Occurring in Embarrass, Kaskaskia, and Hurricane drainages:

Notropis chrysocephalus
Phenacobius mirabilis
Etheostoma caeruleum
Pimephales notatus

Occurring in Embarrass, Kaskaskia, and Little Wabash drainages:

Dorosoma cepedianum
Esox americanus
Cyprinus carpio
Lepomis humilis
Pomoxis annularis

Occurring in Embarrass, Hurricane, and Little Wabash drainages:

Notropis whipplei
Etheostoma spectabile

Present Populations Compared to 1913 Report of Hankinson

T.H. Hankinson reported 70 species of fishes from Coles County, Illinois. One of these is no longer considered to be a distinct species (Ictalurus anguilla now included in Ictalurus punctatus). Three species, not recognized as species during Hankinson's time, probably were present in the population of the county at that time. They are Notropis spilopterus (included in N. whipplii;)Micropterus punctulatus (included in M. salmoides); and Etheostoma spectabile (included in E. caeruleum). Thus, 72 species might have been reported in the 1913 study.

Of the 80 species recorded during the present study, 13 were not collected by Hankinson. These are included in the following list (those with an asterisk were included in a hypothetical list of Hankinson's based on distribution data of Forbes & Richardson. There were 16 others on the list which were not collected by us.)

Ichthyomyzon castaneus
Lampetra lamottei
Polyodon spathula
Lepisosteus platostomus*
Hiodon alosoides*
Carpiodes carpio
Ictiobus bubalus*
Ictiobus cyprinellus*
Ictiobus niger*
Moxostoma anisurum*
Anguilla rostrata
Roccus mississippiensis
Aplodinotus grunniens

Only two of the above species could be considered to be relatively numerous now. These are Carpiodes carpio in the Embarrass River and West Branch of Hurricane Creek, and Moxostoma anisurum in the Embarrass drainage. The remainder are not common to rare in occurrance.

The five species collected by Hankinson which were not collected in our work (see annotated list) include one important change in the fish population of the county. The disappearance of Hybopsis amblops amblops (Northern bigeye chub), considered common in the early study, probably reflects the heavier silt load in the streams at the present time (Smith, 1968).

The disappearance of the silver chub (Hybopsis storeriana), last reported (tentatively) during the 1963 fish kill, also indicates a great change from its former abundant rating during Hankinson's time.

Hankinson listed five species of fishes that were present in the Embarrass system and which were absent or very rare in the Kaskaskia system. With the exception of the silver chub indicated above, the same still holds true for the other four (stoneroller, brindled madtom, greenside darter, and rainbow darter). In addition, we also found the quillback carpsucker, spotted sucker, silver redhorse, Northern redhorse, steelcolor shiner, bullhead minnow, brook silverside, fantail darter, orangethroat darter, and dusky darter to be relatively common in the Embarrass system and not collected from the Kaskaskia system.

In the reverse situation (common in the Kaskaskia, rare or absent in the Embarrass), Hankinson listed six species: spotted sucker, silvery minnow, hornyhead chub, tadpole madtom, pirate perch, and orangespotted sunfish. This holds true now for only the silvery minnow, tadpole madtom, and the hornyhead chub. The reverse is true for the spotted

sucker (above). The pirate perch is relatively common in some places in the Embarrass system. The orangespotted sunfish, due to the influence of Lake Charleston and Lake Oakland, would not be considered rare in the Embarrass drainage now. The red shiner would have to be added to the list since it was not taken definitely in the Embarrass drainage but was found in all streams of the Kaskaskia drainage.

Table 1. Distribution of Fishes by Stream

	Ichthyomyzon castaneus	Lampetra lamottei	Polyodon spathula	Lepisosteus osseus	Lepisosteus platostomus	Amia calva	Hiodon alosoides	Dorosoma cepedianum	Esox americanus	Carpiodes carpio	Carpiodes cyprinus	Carpiodes velifer	Catostomus commersoni	Erimyzon oblongus	Hypentelium nigricans	Ictiobus bubalus	Ictiobus cyprinellus	Ictiobus niger	Minytreme melanops	Moxostoma anisurum	Moxostoma erythrurum	Moxostoma macrolepidotum
Embarrass	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Kickapoo	x							x			x		x	x	x				x		x	x
Polecat								x	x											x		
Riley								x					x	x								
Whetstone											(x)		x	x								
Indian											(x)		x	x	x							
Union								x					x	x	x				x	x	(x)	
L. Embarrass								x	x		x		x	x	x				x	x	x	
Cassell								x	x		x		x	x	x					x	x	x
Greasy								x	x				x	x	x				x			
Hog									x					x							x	
Hurricane W.										x			x	x	x							
Hurricane E.														x							x	
Opossum														x							(x)	
Kaskaskia				x				x	x					x		x					x	
Flat Br.									x				x	x							x	
Crabapple									x				x	x							x	
Whitley													x	x								
L. Wabash								x	x												x	
Clear													x	x								
1913				x		x		x	x*		x	x*	x	x*	x*				x		x*	x*

Table 1 (cont)

	1913	Clear	L. Wabash	Whitley	Crabapple	Flat Br.	Kaskaskia	Opossum	Hurricane E.	Hurricane W.	Hog	Greasy	Cassell	E. Embarrass	Union	Indian	Whetstone	Riley	Polecat	Kickapoo	Embarrass
Campostoma anomalum pullum	x	x			x		x	x	x	x		x	x	x	x	x	x	x	x	x	x
Cyprinus carpio	x	x	x		x	x							x		x				x	x	x
Ericymba buccata	x	x				x		x	x	x		x	x	x	x	x	x		x	x	x
Hybognathus nuchalis nuchalis	x				x	x	x														
Hybopsis storeriana	x*																				x
Nocomis biguttata	x*					x															
Notemigonus crysoleucas	x*			x	x	x	x				x		x						x	x	
Notropis atherinoides	x													x							x
Notropis boops	x*																				x
Notropis chrysocephalus chrysocephalus	x*				x	x	x	x	x	x		x	x	x	x	x	x		x	x	x
Notropis lutrensis	x			x	x	x	x							(x)							
Notropis spilopterus		x	x		x	x		x	x	x		x		x	x				x	x	x
Notropis stramineus stramineus	x*	x	x	x	x	x			x	x		x	x	x		x	x		x	x	x
Notropis umbratilis	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Notropis whipplei	x		x						x	x	⊗	x		x	x	x			x	x	x
Phenacobius mirabilis	x					x			x	x		x			x			x	x	x	x
Pimephales notatus	x			x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Pimephales promelas promelas	x			x	x	x					x	x	x		x	x	x	x	x	x	x
Pimephales vigilas perspicuus	x*														x				x	x	x
Semotilus atromaculatus	x	x		x	x	x		x	x	x		x	x	x	x	x	x	x	x	x	x

Table 1 (cont)

	Ictalurus melas	Ictalurus natalis	Ictalurus punctatus	Noturus exilis	Noturus gyrinus	Noturus miurus	Noturus nocturnus	Pylodictis olivaris	Anguilla rostrata	Aphredoderus sayanus	Fundulus notatus	Labidesthes sicculus	Roccus mississippiensis
Embarrass	x	x	x	x		x	x	x	x	x	x	x	x
Kickapoo	x	x	x							x	x		
Polecat	x	x				x				x	x		
Riley	x									x	x		
Whetstone										x			
Indian													
Union		x											
L. Embarrass		x				x				x	x		
Cassell	x	x							x	x	x		
Greasy	x	x				x				x			
Hog	x									x	x		
Hurricane W.	x	x								x	x		
Hurricane E.										x			
Opossum										x			
Kaskaskia					x	x	x			x			
Flat Br.	x	x			x		x			x	x		
Crabapple	x	x								x	x		
Whitley	x	x								x			
L. Wabash	x										x		
Clear	x	x									x		
1913	x*	x*	x	x*	x*	x*	x*	x*		x	x	x	

Table 1 (cont)

	Ambloplites rupestris	Chaenobryttus gulosus	Lepomis cyanellus	Lepomis humilus	Lepomis macrochirus macrochirus	Lepomis megalotis megalotis	Micropterus dolomieui dolomieui	Micropterus punctulatus punctalatus	Micropterus salmoides salmoides	Pomoxis annularis	Pomoxis nigromaculatus
Embarrass	x	x	x	x	x	x	x	x	x	x	x
Kickapoo			x		x	x		x		x	
Polecat			x		x	x		x	x	x	
Riley			x			x					
Whetstone			x		x	x		x	x		
Indian			x		x	x		x			
Union			x		x	x		x			
L. Embarrass			x		x	x		x	x		
Cassell			x		x	x		x			
Greasy			x		x	x		x	x		
Hog		⊗	x	⊗	x			⊗	⊗	⊗	
Hurricane W.			x		x	x					
Hurricane E.			x		x	x					
Opposum			x		x						
Kaskaskia	x		x		x	x					
Flat Br.			x	x	x	x		x	x	x	
Crabapple			x		x	x					
Whitley			x		x						
L. Wabash			x	x	x	x			x	x	
Clear			x		x	x		x		x	
1913	x	x	x	x	x*	x	x		x	x	x*

Table 1 (cont.)

	Ammocrypta pellucida	Etheostoma asprigene	Etheostoma blennioides	Etheostoma caeruleum	Etheostoma flabellare	Etheostoma gracile	Etheostoma nigrum nigrum	Etheostoma spectabile spectabile	Percina caprodes	Percina maculata	Percina phoxocephala	Percina sciera sciera	Stizostedion canadense	Aplodinotus grunniens
Embarrass	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Kickapoo				x	x		x					x		
Polecat			x	x	x		x	x	x					
Riley							x							
Whetstone							x	x						
Indian				x			x	x						
Union					x		x							
L. Embarrass			x	x			x		x	x				
Cassell							x			x				
Greasy				x			x			x				
Hog														
Hurricane W.			x	x			x	x						
Hurricane E.							x	x						
Opossum								x						
Kaskaskia				x			x		x	x	x			
Flat Br.							x			x				
Crabapple							x							
Whitley														
L. Wabash							x							
Clear								x						
1913	x	x	x*	x	x	::	x*		x	x*	x*	x	x	

(x) Collected from Lake Oakland

* Name changed since 1913

SECTION IX

WATER QUALITY DATA

The results of the limnological chemical-physical tests performed during this study are included in appendix D. Table 2 is a summary of these data sheets in which high-low values have been listed. After considerable thought it was decided not to provide mean values and standard deviations. This has not been done because of the rounding effects even these simple procedures have on raw data. In a temperate area this is particularly true because of the effect of temperature and light on such characteristics as dissolved oxygen, carbon dioxide, pH, turbidity, etc. Because all of the limnological data are interrelated at some level of complexity, data from temperate streams have this limitation in their analyses.

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Table 2 - 1967-1968 DATA RANGES GIVEN (LOW-HIGH)

Stream	No. of Coll.	Dissolved O_2 (ppm)	Turbidity JTU
Embarrass River	8	7.0- 9.0	5-60
Kickapoo Creek	16	6.5-15.0	5-109
Polecat Creek	12	8.0-20.0	5-170
Riley Creek	4	7.1-14.0	15- 30
Whetstone Creek	4	14.0-15.0	17-110
Indian Creek	4	7.5-15.0	L1.0-80
Union Dr. Dist. #3	5	6.5-14.0	25- 65
L. Embarrass River	11	5.0-16.0	5- 30
Cassell Creek	19	5.0-15.0	10- 85
Greasy Creek	6	7.5-14-0	L1.0-20
Hog Creek	2	7.7-13.0	20- 32
Hurricane West	3	5.0- 8.5	15-30
Hurricane East	4	6.0- 8.5	5-61
Opossum Creek	2	--	15-15
Kaskaskia River	5	6.5-14.0	20-45
Flat Branch Creek	4	5.5- 6.5	35-50
Crabapple Creek	4	6.5- 6.5	18-38
Little Wabash River	4	7.0- 8.5	12-30
Clear Creek	2	6.0- 8.5	10-22

Table 2 (cont) - 1967-1968 DATA RANGES GIVEN (LOW-HIGH)

Stream	No. of Coll.	NO_3 (ppm)	NO_2 (ppm)	PO_4 (ppm)	SO_4 (ppm)
Embarrass River	8	L.1-13.2	L.01-1.0	0.25-4.20	38- 55
Kickapoo Creek	16	L.1-163	0.15-54.45	3.20-50.00	80-130
Polecat Creek	12	L.1-39.6	0.033-0.4	0.20- 8.0	280150
Riley Creek	4	4.4-26.4	0.033-0.594	0.80- 1.25	72-125
Whetstone Creek	4	26.4-88.0	0.069-0.099	0.22- 6.5	28- 90
Indian Creek	4	One Reading 15.6	One Reading 2.97	0.15- 4.6	62- 80
Union Dr. Dist. #3	5	1.0-24.2	0.066-3.96	0.50-2.8	55-200
L. Embarrass River	11	1.5-22.0	0.03- 7.92	0.3- 2.2	45-100
Cassell Creek	19	L.1-88-0	0.0264-6.6	0.25-34.0	28-150
Greasy Creek	6	4.4-8.8	0.033-0.33	0.30- 3.0	12- 40
Hog Creek	2	0.5-22.0	0.033-0.04	0.70- 8.0	15- 15
Hurricane West	3	0.88-6.0	0.012-0.0528	0.20-1.2	38- 55
Hurricane East	4	7.0-38.0	0.015-0.0354	0.30- 0.78	45- 61
Opossum Creek	2	22.0-22.0	0.12-0.21	--	52- 65
Kaskaskia River	5	2.2-39.6	0.066-0.165	0.08- 0.98	35-300
Flat Branch Creek	4	0.44-35.2	0.01-0/033	0.80- 3.8	25- 30
Crabapple Creek	4	4.4- 4.4	0.264-0.264	1.5- 3.0	33- 33
Little Wabash River	4	1.32-53	0.033-0.73	0.2- 0.6	20-35
Clear Creek	2	4.4-7.0	0.08-0.726	0.6- 1.2	49-90

Table 2-(cont) -1967-1968 DATA RANGES GIVEN (LOW-HIGH)

Stream	No. of Coll.	pH	Hardness Ca ppm	Hardness Total ppm	CO_2
Embarrass River	8	7.5-8.7	110-260	240-470	One Reading 40
Kickapoo Creek	16	6.4-8.7	80-240	215-420	20-60
Polecat Creek	12	8.1-8.6	100-270	220-470	16-120
Riley Creek	4	6.6-8.5	150-220	250-350	28- 56
Whetstone Creek	4	7.8-8.5	100-250	150-300	28-48
Indian Creek	4	8.3-8.6	150-250	270-340	One Reading 200
Union Dr. Dist. #3	5	7.6-8.6	170-250	300-340	One Reading 28
L. Embarrass River	11	7.8-8.6	130-240	260-470	76-86
Cassell Creek	19	7.6-8.65	150-370	300-830	40-120
Greasy Creek	6	7.9-8.45	160-220	300-450	--
Hog Creek	2	7.7-8.3	190-260	300-440	--
Hurricane West	3	7.5-8.45	150-165	280-290	One Reading 48
Hurricane East	4	8.1-8.5	160-190	260-310	22-44
Opossum Creek	2	7.8-8.2	210-210	320-320	--
Kaskaskia River	5	8.2-8.7	200-850	440-950	One Reading 56
Flat Branch Creek	4	8.1-8.75	90-300	250-500	20-240
Crabapple Creek	4	7.1-8.5	210-230	330-350	--
Little Wabash River	4	8.1-8.4	80.300	350-450	One Reading 60
Clear Creek	2	7.5-8.5	100-130	420-430	One Reading 68

Table 2 (cont) 1969-1970 DATA RANGES GIVEN (LOW-HIGH)

Stream	No. of Coll.	Dissolved O_2 (ppm)	Turbidity JTU
Embarrass River	30	9.0-13-5	L1.0-85
Kickapoo Creek	41	3.2-13.5	L1.0-200
Polecat Creek	5	4.2-10.2	10- 60
Riley Creek	6	10.0-13-5	L1.--12
Whetstone Creek	4	--	Only L1.0
Indian Creek	5	9.0-13.0	5-10
Union Dr. Dist #3	17	10.2-22.5	Only 15
L. Embarrass River	8	10.5-12.5	L1.0-40
Cassell Creek	31	11.4-19.0	11-100
Greasy Creek	13	7.7-12.5	L1.0-45
Hog Creek	3	8.5-11.5	10-35
Hurricane West	2	Only 10.5	L1.0-33
Hurricane East	3	Only 12.6	L1.0-10
Opossum Creek	2	Only 11.0	L1.0-5
Kaskaskia River	4	12.0-12.0	5-60
Flat Branch Creek	9	12.0-12.5	?-140
Crabapple Creek	3	Only 13.0	10-55
Whitley Creek	5	8.8-17.0	L1.0-10
Little Wabash Creek	5	4.2-10-2	10-60
Clear Creek	1	Only 10.0	Only 20.0

Table 2 (cont) 1969-1970 DATA RANGES GIVEN (LOW-HIGH)

Stream	No. of Coll.	NO_3 (ppm)	NO_2 (ppm)	PO_4 (ppm)	SO_4 (ppm)
Embarrass River	30	L.1-28	L.01- 5.36	0.08-30	29- 40
Kickapoo Creek	41	4.1-57.2	0.11-6.19	0.90-28.5	41-125
Polecat Creek	5	L.1-44	L.01-1.65	0.1- 3.0	12- 62
Riley Creek	6	22.3-140	0.13-4.95	0.2- 0.9	45- 80
Whetstone Creek	4	12.5- 44	L.01-1.65	0.8-1.4	40-100
Indian Creek	5	L.1- 22	L.01- 0.26	0.2-0.6	50 -60
Union Dr. Dist #3	17	4.3- 45	0.05-0.23	0.07-1.1	12- 70
L. Embarrass River	8	L.1- 44	L.01-2.89	0.10-1.0	35- 65
Cassell Creek	31	L.1-28.6	L.01-0.70	0.08-8.0	33- 90
Greasy Creek	13	L.1-74.8	L.01-5.36	0.05-0.7	20- 52
Hog Creek	3	4.4- 8.8	0.07-0.42	0.10-0.9	10- 50
Hurricane West	2	L.1- 61.6	L.01-1.07	0.40-0.4	30- 85
Hurricane East	3	4.4-22.0	0.03-0.78	0.30-0.4	45- 70
Opossum Creek	2	8.8-17.6	0.40-1.29	0.30-0.8	30- 60
Kaskaskia River	4	4.4-44.0	L.01-4.10	0.80-1.8	90-350
Flat Branch Creek	9	L.1-88.0	L.01-11.55	0.20-30.0	15 -70
Crabapple Creek	3	17.6- 52.8	0.07-2.89	0.20-0.7	30-45
Whitley Creek	5	L.1- 44	L.01-4.95	0.15-1.5	35-52
Little Wabash Creek	5	L.1- 44	L.01-1.65	0.10-3.0	12-62
Clear Creek	1	Only 26.4	Only 3.3	Only 1.0	Only 52

Table 2 (cont) - 1969-1970 DATA RANGES GIVEN (LOW-HIGH)

Stream	No. of Coll.	pH	Hardness Ca (ppm)	Hardness Total (ppm)	CO_2
Embarrass River	30	7.3-8.8	140-270	250-490	--
Kickapoo Creek	41	7.1-8.7	98-260	192-470	B.O.D. 5.6-28.0
Polecat Creek	5	7.7-8.5	230-340	370-410	--
Riley Creek	6	8.1-8.7	80-250	352-450	--
Whetstone Creek	4	8.5-8.6	230-250	430-450	--
Indian Creek	5	8.2-8.7	170-220	400-440	--
Union Dr. Dist #3	17	6.9-8.7	--	--	--
L. Embarrass River	8	8.2-8.7	240-280	430-500	--
Cassell Creek	31	7.0-8.8	220-320	360-520	--
Greasy Creek	13	6.9-8.8	44-270	260-490	--
Hog Creek	3	8.2-8.4	86-250	282-490	--
Hurricane West	2	7.8-8.5	Only 250	Only 460	--
Hurricane East	3	8.4-8.4	Only 240	Only 430	--
Opossum Creek	2	8.4-8.4	Only 170	Only 450	--
Kaskaskia River	4	8.4-8.8	320-330	500-510	--
Flat Branch Creek	9	8.3-8.6	220-230	460-480	--
Crabapple Creek	3	7.7-8.6	Only 270	Only 470	--
Whitley Creek	5	8.2-8.7	59-300	277-580	--
Little Wabash Creek	5	7.7-8.5	230-340	370-410	--
Clear Creek	1	Only 8.7	Only 250	Only 470	--

SECTION X

INVERTEBRATE POPULATIONS

Invertebrate organisms were collected using plankton nets, Eckman and Peterson dredges, and by cruising with dip nets. In almost every case, the taxonomic identification makes it obvious as to whether the organism may be considered benthic, planktonic, nektonic, or neustonic.

Table 3 is a listing of the Insecta collected from the twenty streams during the course of our study. Table 4 is a similar listing of the Crustacea (planktonic and benthic), Table 5 is a listing of the Protozoa (from Plankton samples), and Table 6 includes all other invertebrates collected.

Appendix E indicates the number of plankters per liter from each collection made by station and date.

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Table 3

Insecta I

Insecta Collected from Ekman & Jackson Dredges and Cruising with a Dip Net

	[1] Coleop.					[2] Trichop.			[3] Neurop		[4] Odonata				[5] Plecop		
	Dytiscidae	Elmidae	Hydrophilidae	Haliplidae	Gyrinidae	Hydropsychidae	Hydroptilidae	Heliopychidae	Sialis sp.	Corydalis sp.	Agrion sp.	Libellula sp.	Macromia sp.	Ischnura sp.	Neoperla sp.	Capnia sp.	
Embarrass R.	x	x	x		x							x			x		
Kickapoo C.				x		x											
Polecat C.					x	x											
Riley C.		x															
Whetstone C.	x					x				x			x				
Indian C.	x		x	x	x			x		x		x				x	
Union D.		x				x	x				x	x			x		
L. Embarrass R.		x	x		x			x						x			
Cassell C.						x											
Greasy C.	x	x		x	x		x				x			x		x	
Hog C.			x			x											
Hurricane C.	x	x	x			x	x				x	x			x	x	
East Branch		x	x	x	x	x			x	x				x			
Opossum C.	x					x											
Kaskaskia R.	x		x	x	x		x	x							x		
Flat Branch			x		x							x					
Crabapple C.		x		x							x				x		
Whitley C.	x	x	x	x	x										x		
L. Wabash R.		x													x		
Clear C.		x	x	x							x				x		

[1] Coleoptera [2] Trichoptera [3] Neuroptera [4] Odonata [5] Plecoptera

(Table 3 con't) Insecta II

Insecta collected from Ekman & Jackson Dredges and Cruising with a Dip Net

	Hemiptera			Diptera								Ephemeroptera			
	Gerridae	Notonectidae	Belastomotidae	Coxicidae	Tipulidae	Tabanidae	Simuliidae	Culicidae	Tendipedidae	Certapogonides	Anthomyiidae	Ephemeridae sp.	Baetedae sp.	Heptogenidae sp.	Ephemerae
Embarrass R.	x		x	x			x	x	x				x		x
Kickapoo C.					x	x	x		x		x				
Polecat C.	x					x	x		x						
Riley C.						x	x		x		x				
Whetstone C.		x				x	x		x				x		
Indian C.	x	x		x			x	x	x			x			
Union D.		x		x			x	x	x					x	x
L.Embarrass R.	x	x	x		x		x		x					x	x
Cassell C.						x	x		x		x				
Greasy C.		x	x				x		x			x	x		
Hog C.							x		x		x				
Hurricane C.		x		x		x		x	x			x	x		
East Branch		x	x		x		x		x			x		x	
Opossum C.		x					x		x	x		x			x
Kaskaskia R.		x	x	x		x	x		x			x		x	
Flat Branch		x		x			x		x		x				
Crabapple C.				x	x		x		x				x		x
Whitley C.		x	x	x			x		x			x		x	
L. Wabash R.			x	x			x		x		x		x	x	
Clear C.				x	x		x		x		x				

Table 4 - Macroinvertebrates - Crustacea collected per station during the Study Period by all Sampling Methods

	Daphnia	Simocephalus	Bosmina	Alona	Hyalella	Gammarus	Acellus	Procambarus	Cambarus	Orconectes	Diaptomus	Cyclops	Canthocamptus
Embarrass R.	x			x		x	x	x	x	x		x	x
Kickapoo C.					x		x	x					
Polecat C.					x		x	x			x		x
Riley C.							x					x	
Whetstone C.	x					x	x						
Indian C.		x	x	x			x		x		x	x	
Union D.	x			x			x	x			x		
L.Embarrass R.					x	x				x		x	
Cassell C.							x						
Greasy C.	x	x				x	x	x					x
Hog C.	x	x			x	x	x			x	x		x
Hurricane C.			x			x	x	x					
East Branch	x	x			x					x		x	
Opossum C.		x						x		x			x
Kaskaskia R.	x	x				x		x	x			x	x
Flat Branch				x		x					x		
Crabapple C.	x	x	x	x								x	x
Whitley C.	x	x								x	x		
L. Wabash R.						x				x		x	
Clear C.	x	x				x					x		

(Table 5)- Protozoa collected per station during the Study Period by all Sampling Methods

	Difflugia	Arcella	Centropyxis	Amoeba	Ceratium	Dinobryon	Euglena	Gonium	Folorina	Prodon	Coleps	Dileptus	Paramecium	Blepharisma	Stentor	Spirpstomum	Euplotes	Vorticella	Epistylis	Carchesium
Embarrass R.	x	x			x		x	x		x	x		x	x	x	x		x	x	
Kickapoo C.				x			x			x	x						x			
Polecat C.				x			x				x		x		x			x		
Riley C.	x		x	x			x					x		x			x		x	
Whetstone C.		x			x	x	x	x	x			x			x	x		x		x
Indian C.	x	x		x	x		x			x		x	x	x			x		x	
Union D.	x	x	x	x			x					x		x					x	
L. Embarrass R.	x		x				x	x	x		x		x			x		x	x	x
Cassell C.	x			x			x			x			x		x		x			
Greasy C.	x			x		x	x			x		x	x				x			x
Hog C.	x			x			x					x	x		x					
Hurricane C.	x	x	x		x		x	x	x		x	x	x		x	x		x	x	
East Branch	x		x		x	x	x		x		x				x		x		x	
Opossum C.	x	x		x			x						x				x			
Kaskaskia R.	x		x	x	x		x		x		x		x	x		x	x	x		x
Flat Branch	x			x							x					x			x	
Crabapple C.		x	x	x		x	x	x		x			x		x		x	x		
Whitley C.	x		x		x	x			x				x				x			x
L. Wabash R.	x			x			x						x			x		x		
Clear C.				x			x						x		x				x	x

Table 6 - All Other Invertebrates collected per Station During the Study Period by all Sampling Methods

	Rotifera					Oligochaetes							Mollusca					
	Hydrozoa	Monostyla	Branchionus	Asplanchna	Synchaeta	Dugesia	Peloscolex	Aelosoma	Dero	Tubifex	Limnodrilus	Chaetogaster	Haemopis	Musculium	Sphaerium	Helisoma	Physa	Pleurocera
Embarrass R.	x		x	x		x	x	x	x	x	x	x	x	x	x	x	x	x
Kickapoo C.					x	x			x	x	x		x				x	
Polecat C.		x								x	x		x	x	x			
Riley C.		x								x	x		x		x		x	
Whetstone C.	x	x	x	x	x				x	x		x	x		x	x	x	
Indian C.		x	x	x				x		x	x	x			x			x
Union C.		x			x			x		x	x			x	x			
L. Embarrass R	x	x	x	x		x					x		x		x	x		x
Cassell C.				x						x	x			x				
Greasy C.	x		x	x	x		x	x		x	x		x		x			
Hog C.		x	x	x		x				x	x		x	x				
Hurricane C.	x	x	x		x			x	x	x	x	x		x		x		
East Branch	x	x	x	x			x	x		x					x			
Opossum C.			x					x		x								
Kaskaskia R.	x	x	x	x	x	x				x	x		x	x	x			x
Flat Branch	x				x			x					x	x				
Crabapple C.		x					x	x			x							
Whitley C.			x			x						x						
L. Wabash R.	x	x		x							x	x				x		
Clear C.		x											x				x	

SECTION XI

GENERAL CHARACTER OF THE STREAMS OF COLES COUNTY

Embarrass River

The water quality of this, the largest stream in the county, is good. High dissolved oxygen values of 7.0 ppm or greater were recorded. Nitrate concentrations were within normal limits of 10.0 to 30.0 ppm. Some phosphate levels were high, but these were widely scattered as to dates of occurrence. Other physical and chemical values were normal.

Plankton populations for the Embarrass were highest of any station considering its size and flow. Populations ranged from 7,742 plankters/liter to a high of 28,000 plankters/liter. Thirteen genera of protozoans and three genera of rotifers were identified. A number of diatoms and other algae were not identified.

The invertebrate population of the benthic community was diverse. Included were 7 genera of aquatic Oligochaeta, 5 genera of Mollusca, 9 general of Crustacea, and 14 families of Insecta. The total invertebrate population is diverse with no single species or ecological type dominating.

The greatest number of fish species was found in this stream with many indicative of relatively good water quality. The predominant forms were minnows,; particularly the steelcolor shiner, spotfin shiner, bluntnose minnow, silverjaw minnow, and bullhead minnow. These made up over 50% (by number) of the fishes collected.

Kickapoo Creek

This creek receives effluent from secondary sewage treatment facilities and maintains a steady year-round flow. Nitrate levels were above 40.0 ppm on several occasions. Nitrites and phosphate levels were correspondingly high, at values of 1.5 ppm and 10.0 ppm respectively. Only one dissolved oxygen concentration was below 5.0 ppm. Several measurements were above 100% saturation.

Plankton populations were sparce and restricted in their diversity. Populations ranged above the average mean from 1,334 to 14,334/liter. In addition to a few diatoms and other algae, five genera of Protozoa and one genus of Rotifera were identified. The aquatic Oligochaetes consisted of three genera, each associated with polluted areas. A single genus of Mollusca, Physa, was collected. Three genera of Crustacea and seven families of insects were identified. Of the Insecta, five of the seven families were dipterous forms, common to polluted environments.

The invertebrate population is restricted in the number of forms present. Populations that are present are usually large. From the invertebrate population data, Kickapoo is a distrubed area showing abnormal populations.

The majority of the fishes recorded from Kickapoo Creek were taken well downstream. From its source to about four miles east of Mattoon, and from below the outfall of the Charleston sewage effluent for about 3/4 mile, this creek was essentially barren of fishes. These areas need to be cleaned up through better sewage treatment. The creek chub, silverjaw minnow, bluntnose minnow and stoneroller made up over 70% of the numbers collected.

Polecat Creek

The limnological data are normal for dissolved oxygen, temperature, turbidity, etc. During the later stages of this study the nitrate-nitrite levels were increasing and reached the 30.0 to 40.0 ppm level. The pH values ranged from 8.1 to 8.6, and total hardness values varies from 220 to 470 ppm.

Plankton populations are rather constant and range from 9,667 to 12,334/liter. Seven genera of Protozoa and one genus of Rotifera were identified. Two species of Oligochaeta and a genus of Hirudinia were collected, as well as two genera of Mollusca. Five genera of Crustacea, and six families of Insecta were also collected. Insects were more varied than in Kickapoo Creek, and several forms associated with relatively clean areas were identified.

The invertebrate population is rather sparce but seems to be more diverse than in other areas such as Cassell Creek or Riley Creek. The stream seems to be in a state of permanent recovery if placed on the conventional scale of aquatic zones as septic recovery, and normal.

The fish population is quite varied and abundant for a stream of this small size, indicating a fairly good condition. Minnows again were the predominant forms. Darters made up almost six per cent of the population.

Riley Creek

Riley Creek had high values for nitrates and nitrites. Phosphates are also high on occasion and hardness values are low. No oxygen depletion or turbidity values have been observed which would indicate organic enrichment or flocculants, but there is a suspicion of that sort about this stream. One half of the dissolved oxygen values are above saturation at the temperature recorded. This is not unusual for shallow, exposed

streams in which photosynthesis and agitation in riffles provide the mechanism for such supersaturated conditions.

The plankton populations are normal and in the range of 3,667 to 12,334 plankters per liter. A number of diatoms were present as well as more blue-green algae than in any other stream. Eight genera of Protozoa and one genus of Rotifera were observed. The most common protozoans were of the genera Euglena and Dileptus. The aquatic annelids included Tubifex sp., Limnodrilus sp. and a leech, Haemopsis. Only two genera of Mollusca were present. Five families of insects were present, and four of the five are dipterans.

The invertebrate population of Riley Creek is rather restricted in the number of species present. Those genera that are present are ones often associated with pollution and polluted environments.

Several fish kills have occurred on this stream, in the past three years. In two instances, the sources of the pollutants were discovered and corrective action has been taken. The limited number of species of fishes reflect the problems that have been associated with this stream. Bluntnose minnows made up 49% of the total numbers collected. Redfin shiners (13.7%) and Johnny darters (12.8%) were also common.

Whetstone Creek

Two nitrate-nitrite values were high in samples from this stream. Phosphate values were also high and seemed to mirror the nitrate-nitrite levels. However, these were rather widely spread and sporadic. All D.O. samples were above 100% saturations for reasons previously stated.

The plankton population on Whetstone Creek was relatively high for stream of its size. Values of 6,734 to 15,334/liter were recorded. The protozoan population was very diverse and included 11 species. Hydra sp. was collected as were three genera of Rotifera. Worms included three genera of Oligochaeta and Haemopsis leeches. The mollusks collected included three genera. There were three genera of Crustacea and nine families of insects.

The invertebrate population is diverse at the protozoan level. This diversity is not as readily apparent in the insects as one might expect, but the extent of the sampling may have been a factor.

Most of the 18 species of fishes collected from this stream in significant numbers were of the more tolerant types, indicating the possibility of some occasional problems in this

stream. Recent Soil Conservation Service work in erosion control along this stream may help eliminate the problems. Silverjaw minnows (45.4%), bluntnose minnows (20.65%), and creek chubs (14.4%) were the most common species.

Indian Creek

The chemical and physical data for Indian Creek are rather sparce. On the whole they indicate a stream which has a higher turbidity than most others, but little else. The nitrate-nitrite levels are low in comparison to a number of other streams. Five samples were taken with D.O. levels above 100% saturation.

The plankton populations of Indian Creek was very diverse but spa-ce. The range and mean of 867 to 6,334 plankters/liter is low, but there were 11 genera of protozoans and three genera of rotifers. In the benthic samples four genera of Oligochaeta, two of Mollusca, and seven Crustacea were identified. Fifteen families of insects were identified with diverse distribution of ecological types.

The data show a diverse population of invertebrates in Indian Creek and an absence of any disruptive water quality characteristics.

The fish population is diverse and abundant; with several species (hog sucker, darters) which would indicate relatively clean water. Silverjaw minnows (62.2%) creek chubs (13.3%) and stonerollers (12.6%) were most abundant.

Union Drainage

The watershed of the Union Drainage area seems to pro/ide a nitrate source. The nitrate-nitrite levels are high. This is not followed, however, by high phosphate levels. Other water quality values are normal. Again D.O. values are very high.

Several large plankton populations were observed in Union Drainage samples. A range of 6,667 to 15,766 plankters/liter was found. Eight genera of protozoans were recognized, and two genera of rotifers were commonly abundant. Three genera of Oligochaeta and two of Mollusca were also collected. The crustacean population was average with five genera identified. A rather diverse insect population was present with 13 families identified.

The population of this area tends to show a diversity of normal forms, but the plankton population would appear to be reacting in a positive manner to the nitrate-nitrite levels.

The fish population was good in this stream considering its small size. It is mainly a minnow stream with creek chubs (21.2%), bluntnose (16.9%), fathead (14.7%), silverjaws, redfins, and stonerollers (2.12%) each. Some species with low pollution tolerances are present.

Little Embarrass

The limnological data show a basically healthy stream. The turbidity is less than in other streams, and with the exception of two samples, the nitrate-nitrite values are normal.

The plankton populations are also rather normal 6,667 to 15,334/liter. The diversity of organisms is good with 11 genera of protozoans, Hydra, three rotifers, Limnodrilus sp. in the aquatic Oligochaeta group, Haemopsis sp. leech, three molluscans, four crustaceans and 13 families of insects. The insects represented are particularily indicative of a solid population without primary disruption from pollution.

The fish population also shows a healthy condition--diverse and in good numbers. Pollution intolerant species are present in abundance. The redfin shiner, bluntnose minnow and silverjaw minnow are most common.

Cassell Creek

Oxygen levels in Cassell appear to be adequate, yet in several samples were as low as 5.0 ppm. Nine were above 100% saturation. These are not crucially low values, but are lower than most values from all of the streams studied. Turbidity ranged in values from 100, 85, and 78 ppm to 10, 11, and 13 ppm. Nitrate-nitrite levels of 88, 78 and 44 ppm, along with rather low readings of 2, 4, and 7 ppm also relfected a very wide range. Perhaps the high number of samples is contributing to this fluctuation.

Plankton samples were below average and were composed of a few diatoms, blue-green algae, and small protozoans. Populations of 4,334, to 7,775/liter were taken. Only six genera of protozoans were identified and these were mostly ciliates. Only one genus of rotifer was found. Two genera of aquatic oligochaetes were identified, both common to polluted environments. Only one mollusk and one crustacean were found. Of the five insect families, four were dipterous.

The data tend to show Cassell Creek as an area which may be characterized as disturbed; with pollution-type fauna.

The fishes, while fairly abundant, contain few pollution intolerant pecies. Those present were taken upstream, above the area near where the Charleston sewage plant effluent would

have an effect. This should clear up with the abandoning of the present sewage plant for a new tertiary treatment plant under construction. Bluntnose and fathead minnows, and creek chubs are most abundant in numbers.

Greasy Creek

The limnological data for Greasy Creek show normal values for almost every sample. With the exception of two high nitrate readings the level of nitrate-nitrite is well within normal limits. Of the two high readings, one was accompanied by a high nitrite level as well. However, these do not seem to have altered the nature of the stream to any degree.

The plankton samples from Greasy Creek ranged from 1,667 to 8,667 plankters per liter. Nine genera of protozoans were identified along with three genera of rotifers. Hydra was collected from this stream on several occasions. Aquatic worms collected included Aelosoma and Peloscolex, two rather clean-water forms, as well as Tubifex and Limnodrilus. Sphaerium was the only mollusk collected. Six crustacean genera were observed. The insect population was very diverse with 14 families identified. Coleoptera, Diptera, and Hemiptera were well represented. The invertebrate population appears to be diverse and situated on a firm base.

The fish population is also good for a stream of this small size. The bluntnose minnow (33.3%), creek chub (19%), and stoneroller (11.6%) were most abundant.

Hog Creek

Samples from Hog Creek were taken on only five dates. The inacessibility of the area makes it difficult to sample. Of the samples taken, none indicate abnormal water quality.

The invertebrate samples from Hog Creek indicate a rather restricted population. Plankton samples ranged from 667 to 7,334 plankters per liter. Only six genera of protozoans were identified. There was a considerable rotifer population in numbers with three genera identified. The only aquatic worms were Tubifex and Limnodrilus, but they were not present in extremely large numbers. The only mollusk was Sphaerium. The crustacean population included eight genera but was very spotty in quantity. Only five insect families were represented and the majority of forms were tendipedids, simulia, and anthiomyiids. These are usually found in large numbers in disturbed areas.

The lack of depth of the data preclude any diagnosis of Hog Creek. It seems to be a mixture of clean-water and polluted-water forms.

The fish population is influenced greatly by the fact that Hog Creek flows through Lake Oakland. It is a small stream, with shiners and sunfishes making up the bulk of the population. This stream contained the fewest number of species of any of the streams, but this may reflect its small size and the few collections made. Green sunfish (27.7%), and bluegills (22.7%) were most abundant.

Hurricane Creek--West Branch

A single station was established on this stream, and the data consist of five collections. In one of these samples, the nitrate level was rather high as were the hardness values.

The plankton population ranged from 5,667 to 6,667/liter and was very diverse. Fourteen genera of protozoans were collected and identified. Hydra and three genera of rotifers were collected. A very diverse aquatic worm population was present, including representatives of five genera. Two molluscan genera and four genera of crustaceans were sampled. Sixteen families of insects were collected; the most diverse insect population encountered.

The sampling dates may account in part for the diversity of forms collected. This appears to be a well balanced area from the standpoint of invertebrate forms.

In view of the relatively few fish collections made, the representatives taken were quite numerous and diverse. A healthy population is indicated. Silverjaw minnows (37.7%), bluntnose minnows (22.2%), and striped shiners (7.2%) were most common. Darters (four species) made up 7% of the population.

Hurricane Creek--East Branch

The data from the East Branch of Hurricane Creek have the same general appearance as those from the West Branch and the same limitations. With one exception (38 ppm) nitrate levels were low. The dissolved oxygen also is a little lower than in most areas, but it is adequate. These low values are probably associated with a period of low flow.

The invertebrate population is almost as diverse as in the West Branch. Low plankton populations of 3,334 to 3,667/liter were recorded. Ten genera of protozoans and three genera of rotifers were collected. Four genera of aquatic oligochaetes were identified including two clean-water forms, Peloscolex and Aelosoma. The only mollusk collected was Sphaerium. There were five genera of crustacea and 15 genera of insects. The insect population was at least at diverse as in the West Branch.

As in the West Branch, a diverse well-balanced population of invertebrates is present and indicates a healthy stream.

The fish population also indicates a healthy condition, with good numbers of most species. It is made up primarily of bluntnose and silverjaw minnows, and sand shiners. The orangethroat darter made up 4.2% of the population.

Opossum Creek

The two stations on Opossum Creek were sampled twice. The data show no abnormal values for either of the areas.

The plankton population for this stream was the lowest of any, 667 and 1,334 plankters per liter. Six genera of protozoans, one rotifer and two genera of aquatic worms were collected. A few specimens of Physa were the only mollusks collected and only four genera of crustaceans were identified. Of the eight families of insects, three were dipterous including a number of tendipedids.

With only two fish samples taken, the list of species is probably not complete. The large number of orangethroat darters is a healthy sign. Creek chubs (41.7%), stonerollers (10.8%), and creek chubsuckers (12.8%) were the predominant forms.

Kaskaskia River

The samples from the Kaskaskia River show three high nitrate-nitrite levels. Phosphate and sulfate levels are also high in certain samples. Excessive hardness values, as high as 950 ppm for total hardness, also indicate the influence of some altering factor. This factor may be watershed in origin or possibly an effluent received by the stream.

Plankton was plentiful and diverse in the samples from the Kaskaskia River and populations from 6,667 to 14,334 plankters per liter were recorded. A total of 13 genera of Protozoa and four genera of Rotifera was identified. Three genera of aquatic Oligochaeta were collected. The crustacean population was represented by seven genera, and 15 families of insects were identified.

The population diversity is not unusual for a stream the size of the Kaskaskia River in which a number of habitats exist.

In view of the relatively few fish collections made from this river, the fish population appears good, indicating no excessive problems in Coles County. Bluntnose minnows (24.1%), redfin shiners (18.5%), and western silvery minnows (7.5%) are the most common species.

Flat Branch Creek

This stream shows a fluctuating turbidity unlike most of the streams. Several high nitrate-nitrite and phsophate values were also recorded. One value, 30.0 ppm phosphate may be questionable. However, several other values are correspondingly as high. Hardness also fluctuates and several readings in the 400 to 500 ppm were recorded. 1967 values were low and 1968 and 1969 values were high.

The plankton population of this stream ranged between 1,667 and 3,334 plankters per liter. Five genera of protozoans were collected; one genus of rotifers, one leech, and eight families of insects were identified.

The data indicate a lack of diversity of the invertebrate population and a varying chemical and physical nature.

Fish kills have occurred on this stream in the Humboldt area. These have been due to accidental (or purposeful) dumping of materials into the stream. The population appears to recover well, with good variety and numbers. Bluntnose minnows (28.5%), redfin shiners (27.7%) and red shiners (15.5%) are most abundant.

Crabapple Creek

The two stations on this stream were sampled three or four times each. The data show a stream with a fluctuating turbidity, a pH that shows a greater range than any stream of its size, and one high value for nitrate-nitrite levels.

The plankton populations ranged from 5,667 to 8,334/liter with a diverse composition. Eleven genera of protozoans, one rotifer, and six crustaceans were identified. Three aquatic Oligochaeta genera were collected, and 10 families of insects were identified.

The diversity of the invertebrates indicate a near normal ecosystem.

The fish population also reflects the above, and there was a good variety of species for its size. The redfin shiner (23.9%), bluntnose minnow (19%), and Johnny darter (16%) were most common.

Whitley Creek

The limited data from this stream indicate the possibility of high nitrate-nitrite levels. D.O. concentrations were always above 100% saturation. The elevation of total hardness

to 580 ppm, nearly double other values, may be due to sampling error. Other values for water quality are normal. All dissolved oxygen values were greater than saturation values due to the riffles, open exposure and photosynthesis of the phytoplankton of the stream.

Populations of 667 to 2,334 plankters per liter were recorded. Eight genera of protozoans, one rotifer, and four genera of crustaceans were identified. A single aquatic oligochaete, Chaetogaster was recorded and that occurrence is questionable because of Chaetogaster being associated as an ectoparasite with crayfish. However Cambarus was collected. The insect population was diverse, with 14 families collected. Coleoptera was a well represented order.

The insects collected indicate a rather well developed, diverse population. This does not particularly agree with the plankton data.

The small size of the stream is reflected in the number of species of fishes (12) collected. Fathead minnows (39.7%), golden shiners (16.7%), creek chubs (8.6%), and bluegills (8.4%) were common.

Little Wabash

The limnological data for this stream are normal except for two high values for nitrates: one at 53 ppm and the second at 44 ppm. Other than these values, normal conditions are apparently present.

Plankton populations were rather uniform. Values of 2,667 to 7,334 plankters per liter were found. The plankton included six genera of rotifers, two genera of aquatic oligochaetes, one Mollusca, and three Crustacea. Nine families of insects were represented including several coleopterans and dipterans.

Compared with the chemical and physical data, one would expect a greater population diversity.

The fish population reflects the fact that this stream is associated with Lake Mattoon and Paradise Lake. The sunfish population is high: the highest percentage of any of the streams studied (48.3%). Seven of the 16 species collected were in the sunfish family. The redfin shiner (25.9%) was also very abundant.

Clear Creek

The samples from this stream show all normal values except for a single nitrate-nitrite value. The figure, 26.4 ppm NO_3, is

not a high value; but is several times greater than the other concentrations.

The plankton samples were calculated at 1,334 to 1,667 plankters per liter. Six protozoans, one rotifer and two crustaceans were identified. In addition, one genus of mollusca, Physa, and one leech, Haemposis, were identified. There were nine genera of insects, four of which were dipterous forms. This conforms to the seasonal levels which this creek shows. It is dry or nearly so during most of late summer. The invertebrate population is sparce.

This small stream is also associated with Lake Mattoon. However, it is located above the lake, and the fish population is not as affected as in the Little Wabash. A predominance of headwater species was present. Stonerollers (48.4%), silverjaw minnows (17.6%) and creek chubs (15.1%) were abundant.

SECTION XII

TYPES OF POLLUTION ENCOUNTERED

One of the most troublesome and widespread types of pollution in Coles County is that of silt. This occurs in all the streams to one degree or another and particularly after periods of rainfall. Much of this is due to agricultural practices in areas subject to severe erosion and which have been cleared of their original vegetation. The watersheds in the county are primarily agricultural, with corn and soy beans as the two major crops.

Associated with this, and correlated with siltation, are the methods used to increase the productivity of the soil. Quantities of fertilizers, herbicides and insecticides applied to the soil are washed into the streams by rain along with the soil, and they thus affect the water quality. At least one relatively small fish kill occurred in Riley Creek. It was thought to have been due to a herbicide.

Grazing of livestock along the shores of the streams results in severe erosion in some areas. Hog farming on a large scale occurs right along the shore of the Embarrass at the Harrison Street bridge east of Charleston. Others are scattered throughout the county.

The sewage treatment plants of both Mattoon and Charleston release their effluents into Kickapoo Creek. A septic zone stretches for almost 4 miles in this stream from Mattoon eastward. The Charleston sewage produces a much shorter septic zone, which will soon be eliminated through the use of a new sewage treatment plant. The treatment will include tertiary treatment, with a minimum of 95% B.O.D. removal.

Other smaller towns have an effect on some of the streams in the county in that they do not have sewage treatment plants. The septic tank fields eventually lead off into the streams. Ashmore has an effect on Polecat Creek; Oakland on the Embarrass; Lerna on Indian Creek; and Humboldt on Flat Branch. Should these towns increase appreciably in size, sewage problems will definitely increase. Oakland and Ashmore are presently in need of sewage treatment facilities.

Industrial pollution occurs in parts of the county. Some of this stems from the use of agricultural field tiles by industry in disposing of some of their wastes. One situation was discovered in the course of this study in which high copper, chromium and acid levels periodically occurred in Riley Creek. Subsequent investigation showed that a manufacturing plant was disposing of a chromate-acid solution used in cleaning copper products by allowing the material to flow through an open ditch and into a field tile system that led to Riley Creek.

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Levels of over 15 ppm copper and 1.5 ppm chromate were encountered. Through the cooperation of the company, the problem has been largely eliminated. Other situations are under investigation at this time. Because of the very extensive field tile system in the county, much of it originally built to drain swamp land years ago, it is often difficult to pin point the source of pollutants.

Oil pollution occasionally occurs in the county from oil fields located near Mattoon. In one instance, a very heavy oil slick occurred on Riley Creek. Subsequent investigation, and with the cooperation of an oil lease operator, disclosed a sizable leak in a pipe line. Repair of the leak was reported to have increased oil production by 20 barrels a day.

Other accidental discharges of toxic materials have occurred. As reported elsewhere in this report, a dumping of sodium cyanide into a drainage ditch at Mattoon, resulted in a complete kill of Kickapoo Creek and 12 miles of the Embarrass River in 1963. In a study of the recovery of these streams, it was determined that full recovery appeared to occur in the third year after the spill.

A train wreck west of the city limits of Charleston in 1968 resulted in a large quantity of detergents spilling into Cassell Creek. Another train wreck on the east edge of Charleston in October, 1969, caused the rupture of two tank cars, one loaded with acetone cyanhydrin, the other with butyl acrylate. Fortunately, these materials were prevented from entering any of the streams. As of March, 1971, treatment of the contaminated area by the railroad is still going on and will probably continue for another 6 to 8 months.

Two small streams that pass through Charleston are in a poor condition and do not contain fishes. One of these, referred to and included in Hankinson's study as Campus Creek, is now contaminated by local septic tanks and occasionally by a sewage lift station. This lift station is to be eliminated very soon as are the septic fields.

The other stream, referred to locally as Town Branch, also receives local contamination. It originates as a drainage ditch for a large drainage district north and east of Charleston. Plans are for a general clean up of this waterway by the city.

While there always may be chances of accidental pollution, there are many instances of chronic pollution in the county that can and should be cleaned up. Efforts are being made along these lines.

SECTION XIII

ACKNOWLEDGMENTS

A number of individuals assisted in many phases of this study. Mr. Ron DeHollander contributed much to the field work, laboratory work, and analysis of raw data during almost the entire period of study. Michael W. Conlin also made many valuable contributions. Others who contributed to this study were Randall Madding, Robert Platt, Steve Platt, Kenneth Alberson, John Dion, Kenneth Brummett, George Hubert, George Johnston, Owen Coker, Thomas Seng, Joseph Decker, Dale Freundt, and Charles Furrey.

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SECTION XIV

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SECTION XV

GLOSSARY

Benthos - Bottom.

Effluent - Waste discharge.

Limnology - Study of freshwaters and their inhabitants.

Nekton - Larger, swimming animals of Pelagic Zone.

Neuston - Organisms living on surface film of water.

Pelagic Zone - Open mass of water as opposed to bottom.

Plankton - Free-floating or barely motile plants and animals, usually microscopic.

Recovery Zone - Stream area where water quality is gradually returning to that which existed prior to entrance of pollutants.

Septic Zone - Area of polluted stream where active decomposition occurs

Synonym - Duplicate name for an organism.

SECTION XVI

APPENDIX A. SUMMARY OF FISH COLLECTIONS, THE STREAMS SAMPLED, THE STATIONS ON EACH STREAM, AND THE NUMBER OF COLLECTIONS FROM EACH STREAM.

Coles County.....80 species of fishes recorded
20 creeks sampled
77 stations determined
234 fish collections
263 water analyses

Embarrass River.....75 species recorded
8 stations
A,B,C,G,H,I,H-2,J
24 fish collections
23 water analyses

Kickapoo Creek.....38 species recorded
9 stations
#40,41,42,43,45,46,47,47A,H-1
30 fish collections
42 water analyses

Polecat Creek.....43 species recorded
9 stations
#5,6,7,10,10B,10C,11,11A
34 fish collections
30 water analyses

Riley Creek.....13 species recorded
2 stations
#28,29
5 fish collections
8 water analyses

Whetstone Creek.....18 species recorded
2 stations
#1,3
10 fish collections
10 water analyses

Indian Creek.....20 species recorded
3 stations
9,9A,9B
10 fish collections
9 water analyses

Union Drainage District #3.....28 species recorded
3stations
#30,32,33
9 fish collections
9 water analyses

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Little Embarrass River.....35 species recorded
4 stations
#13,16,17,19
19 fish collections
19 water analyses

Cassell Creek.....28 species recorded
10 stations
#25,25A-1,25B,26,27,27A
31,34,34A,35
19 fish collections
26 water analyses

Greasy Creek.....27 species recorded
3 stations
#20,21,22
17 fish collections
19 water analyses

Hog Creek.....10 species recorded
1 station
#23
4 fish collections
5 water analyses

West Branch, Hurricane Creek.....28 species recorded
1 station
#48
4 fish collections
5 water analyses

East Branch, Hurricane Creek.....18 species recorded
2 stations
#57,58
6 fish collections
7 water analyses

Opossum Creek.....11 species recorded
2 stations
#51,51A
2 fish collections
4 water analyses

Kaskaskia River.....25 species recorded
4 stations
#2,2B,2C,2D
4 fish collections
9 water analyses

Flat Branch.....33 species recorded
6 stations
#69,69A,70,70A,70B,71
16 fish collections
15 water analyses

Crabapple Creek.....23 species recorded
2 stations
#68A,68B
6 fish collections
8 water analyses

Whitley Creek.....12 species recorded
2 stations
#62,62A
5 fish collections
4 water analyses

Little Wabash River.....16 species recorded
3 stations
#64,64A,64B
8 fish collections
9 water analyses

Clear Creek.....17 species recorded
1 station
#65
2 fish collections
2 water analyses

APPENDIX B.

The following are descriptions of the stations sampled and their locations:

Embarrass River: 8 stations determined and sampled.

Station #A - Located in the N.W. 1/4 Sec. 12, T14N-R10E. Passes through a wooded area. Bottom of gravel and silt. Average depth 2½ feet, average width 75 feet.

Station #B - Located in the S.W. 1/4 of Sec. 14, T14N-R10E. where Rt. 133 crosses the river. Passes through a wooded area. Bottom is of sand, gravel, large rocks, and silt. Average depth 18 inches, average width 60 feet.

Station #C - Located in S.E. 1/4 of Sec. 21, T13N-R10E, at what is locally called "Airtight". Passes through a wooded area. Bottom is of sand, gravel, and silt. Average depth 3 feet, average width 30 feet.

Station #G - Located in the N.E. 1/4 of Sec. 25, T12N-R9E below the Lake Charleston dam and for approximately 500 yards downstream. Passes through pasture and wooded area. Bottom of sand, gravel, and rocks. Average depth 2 feet, average width 25 feet.

Station #H - Located in the S.E. 1/4 of Sec. 35, T12N-R9E. Passes through farm land and wooded area. Bottom of sand and gravel. Average depth 18 inches, average width 20 feet.

Station #H-2 - Located in the S.E. 1/4 of Sec. 35, T12N-R9E. Just above mouth of Kickapoo Creek in the Embarrass River. Average depth 2 feet, average width 30 feet.

Station #I - Located in the S.W. 1/4 of Sec. 2, T11N-R9E. Passes through a wooded area. Bottom of sand and rocks. Average depth 3 feet, average width 40 feet. Locally called Walker's Ford.

Station #J - Located W. of N.W. 1/4 of Sec. 23, T11N-R9E. Wooded Area. Locally called McCann's Ford.

Kickapoo Creek: 8 stations determined and sampled.

Station #40 - Located in the N.E. 1/4 of Sec. 19, T12N-R8E. Passes through farm land, bottom of mud and silt. Average depth one foot, average width 8 feet. There have been no fish collections from this station due to its highly polluted condition.

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Station #41 - Located in the S.E. 1/4 of Sec. 21, T12N-R8E. Passes through farm land and small wooded areas. Bottom of sand, gravel, and silt. Average depth one foot, average width 15 feet.

Station #42 - Located in the N.W. 1/4 of Sec. 25, T12N-R8E. Passes through a wooded area containing some pasture land. Bottom of sand, gravel. Average depth 6 inches, average width 18 feet.

Station #43 - Located in the S.W. 1/4 of Sec. 19, T12N-R8E. Passes through a wooded area containing some farm land. Bottom of sand and gravel. Average depth one foot, average width 15 feet.

Station #45 - Located in the S.E. 1/4 of Sec. 19, T12N-R9E. Passes through a wooded area containing some farm land. Bottom of sand and grave. Average depth 5 inches, average width 14 feet.

Station #46 - Located in the E. 1/2 of Sec. 20, T12N-R9E. It passes through a wooded area containing some farm land. Bottom of sand and gravel. Average depth 6 inches, average width 11 feet.

Sation #47 - Located in the S.W. 1/4 of Sec. 22, T12N-R9E. Passes through a lightly wooded area containing farm land. Bottom of sand and gravel. Average depth 18 inches, average width 20 feet.

Station #47A - Located in the N.W. 1/4 of Sec. 35, T12N-R9E. Passes through a wooded area. Bottom of sand. Average depth 18 inches, average width 15 feet.

Station #H-1 - At mouth of Kickapoo Creek where it meets the Embarrass River. S.E. 1/4 of Sec. 35, T12N-R9E.

Polecat Creek: 9 stations determined and sampled.

Station #5 - Located in the N.E. 1/4 of Sec. 9, T12N-R10E. Passes through a wooded area. Bottom of sand and gravel. Average depth one foot, average width 7 feet.

Station #6 - Located in the S.W. 1/4 of Sec. 2, T12N-R10E. Passes through open farm land. bottom of sand and gravel. Average depth one foot, average width 6 feet.

Station #7 - Located in the N.W. 1/4 of Sec. 10, T12N-R10E. Passes through a wooded area with some farm land to the south. Bottom of sand and gravel and sandstone. Average depth 18 inches, average width 12 feet.

Station #10 - Located in the S.W. 1/4 of Sec. 31, T12N-R14W. Passes through pasture and farm land. Bottom of sand and silt. Average depth 2 feet, average width 8 feet.

Station #10B - Located in the S.E. 1/4 of Sec. 29, T12N-R14W. Passes through farm land. Bottom of sand and silt. Average depth 2 feet, average width 12 feet.

Station #10C - Located in the N.E. 1/4 of Sec. 37, T13N-R14W. At the intersection of the Creek and Rt. 49. Passes through farm land. Bottom of sand and silt. Average depth 2 feet, average width 12 feet.

Station #10D - Located in the S.W. 1/4 of Sec. 33, T13N-R14W. Passes through farm land. Bottom of silt. Average depth one foot, average width 8 feet.

Station #11 - Located in the N.E. 1/4 of Sec. 1, T12N-R10E. Passes through sparsely wooded pasture land. Bottom of silt. Average depth 2½ feet, average width 16 feet.

Station #11A - Located in the N.E. 1/4 of Sec. 6 T12N-R11E. Passes through farm land. Bottom of sand and gravel. Average depth 2 feet, average width 15 feet.

Riley Creek: 2 stations determined and sampled.

Station #28 - Located in the S.E. 1/4 of Sec. 3, T12N-R8E. Passes through farm land. Bottom of sand, gravel, and silt. Average depth 18 inches, average width 10 feet.

Station #29 - Located in the S.E. 1/4 of Sec. 4 T12N-R8E. Passes through farm and pasture land. Bottom of sand and silt. Average depth 18 inches, average width 7 feet.

Whetstone Creek: 2 stations determined and sampled.

Station #1 - Located at the S.E. 1/4 of Sec. 20, T12N-R10E. Passes through a heavily wooded area. Bottom of sand, gravel, and sandstone. Average depth 5 inches, average width 10 feet.

Station #3 - Located at the S.E. 1/4 of Sec. 21, T12N-R10E. Passes through a wooded area. Bottom of sand and gravel. Average depth 15 inches, average width 10 feet.

Indian Creek: 3 stations determined and sampled.

Station #9 - Located in the N.W. 1/4 of Sec. 10, T11N-R9E. Passes through a wooded area. Bottom of sand and gravel. Average depth one foot, average width 8 feet.

Station #9A - Located in the S.W. 1/4 of Sec. 4, T11N-R9E. Passes through a wooded area. Bottom of sand and gravel. Average depth 6 inches, average width 7 feet.

Station #9B - Located in the S.E. 1/4 of Sec. 4, T11N-R9E. Passes through a wooded area. bottom of sand and gravel. Average depth one foot, average width 8 feet.

Union Drainage District #3: 3 stations determined and sampled.

Station #30 - Located at the N.E. 1/4 of Sec. 6, T12N-R9E. Passes through farm land. Bottom of sand and silt. Average depth 6 inches, average width one foot.

Station #32 - Located at the N.W. 1/4 of Sec. 16, T12N-R9E. Passes through wooded pasture land. Bottom of sand and some silt, gravel. Average depth 18 inches, average width 8 feet.

Station #33 - Located at the N.W. 1/4 of Sec. 17, T12N-R9E. Passes through wooded pasture land. Bottom of sand and gravel. Average depth 18 inches, average width 18 feet.

Little Embarrass River: 4 stations determined and sampled.

Station #13 - Located in the S.E. 1/4 of Sec. 36, T14N-R10E. Passes through a heavily wooded area. Bottom of sand, gravel and silt. Average depth 18 inches, average width 25 feet.

Station #16.- Located in the N.E. 1/4 of Sec. 20, T14N-R14W. Passes through a wooded area and farm land. Bottom of sand and silt. Average depth 3 feet, average width 25 feet.

Station #17 - Located in the N.W. 1/4 of Sec. 16, T14N-R14W. Passes through farm land containing some lightly wooded areas. Bottom of sand and silt. Average depth 18 inches, average width 15 feet.

Station #19.- Located in the S.W. 1/4 of Sec. 1, T13N-R10E. Passes through a wooded area. Bottom of sand and gravel. Average depth one foot, average width 8 feet.

Cassell Creek: 10 stations determined and sampled.

Station #25 - Located in the S.W. 1/4 of Sec. 21, T13N-R9E. Passes through farm land. Bottom of silt approximately one foot deep. Average water depth 18 inches, average width 10 feet.

Station #25A-1 - Located in the S.W. 1/4 of Sec. 28, T13N-R9E. Passes through farm land. Bottom of silt. Average depth 2 feet, average width 20 feet.

Station #25B - Located in the S.W. 1/4 of Sec. 33, T13N-R9E. Passes through farm and pasture land. Bottom of silt. Average depth one foot, average width 6 feet.

Station #26.- Located in the N.W. 1/4 of Sec. 4, T12N-R9E. Passes through a wooded area containing farm and pasture land. Bottom of sand and silt. Average depth one foot, average width 15 feet.

Station #27 - Located in the W. 1/2 of Sec. 3, T12N-R9E. Passes through sparsely wooded pasture land. Bottom of sand, gravel and some silt. Average depth one foot, average width 25 feet.

Station #27A - Located in the S.W. 1/4 of Sec. 3, T12N-R9E. Passes through farm and pasture land. Bottom of sand and gravel. Average depth one foot, average width 10 feet.

Station #31 - Located in the N.W. 1/4 of Sec. 16, T12N-R9E. Passes through a sparsely wooded area containing pasture land. Bottom of sand, gravel and silt. Average depth 18 inches, average width 13 feet.

Station #34 - Located in the N.W. 1/4 of Sec. 16 T12N-R9E. Passes through a wooded area containing pasture land. Bottom of mud and silt. Average depth 18 inches, average width 15 feet.

Station #34A - Located in the S.W. 1/4 of Sec. 9, T12N-R9E. Passes through a wooded area. Bottom is of sand and silt. Average depth 2 feet, average width 20 feet.

Station #35 - Located in the N.W. 1/4 of Sec. 21, T12N-R9E. Flows through a wooded area and farm land. Bottom of sand and silt. Average depth 2 feet, average width 15 feet.

Greasy Creek: 3 stations determined and sampled.

Station #20 - Located in the S.W. 1/4 of Sec. 20, T14N-R10E. Passes through lightly wooded farm and pasture land. Bottom of sand, gravel and silt. Average depth one foot, average width 9 feet.

Station #21 - Located in the S.E. 1/4 of Sec. 21, T14N-R10E. Passes through lightly wooded pasture land. Bottom of sand and gravel. Average depth one foot, average width 8 feet.

Station #22 - Located in the S.E. 1/4 of Sec. 20, T14N-R10E. Passes through wooded pasture land. Bottom of sand and gravel. Average depth one foot, average width 7 feet.

Hog Creek: 1 station determined and sampled.

Station #23 - Located in the S.E. 1/4 of Sec. 7, T14N-R14W. Passes through farm land. Bottom of silt. Average depth 2 1/2 feet, average width 14 feet.

Hurricane Creek, West Branch: 1 station determined and sampled.

Station #48 - Located in the S.W. 1/4 of Sec. 15, T11N-R10E. Passes through a wooded pasture land. Bottom of sand and gravel. Average depth one foot, average width 25 feet.

Hurricane Creek, East Branch: 2 stations determined and sampled.

Station #57 - Located in the S.E. 1/4 of Sec. 14, T11N-R10E. Passes through a wooded area with some farm land. Bottom of sar l and gravel. Average depth one foot, average width 12 feet.

Station #58 - Located in the S.E. 1/4 of Sec. 22, T11N-R10E. Passes through farm and pasture land. Bottom of sand and gravel. Average depth one foot, average width 8 feet.

Opossum Creek: 2 stations determined and sampled.

Station #51 - Located at the S.W. 1/4 of Sec. 17, T11N-R10E. Passes through farm and pasture land. Bottom of gravel and mud. Average depth one foot, average width 3 feet.

Station #51A - Located at the S.E. 1/4 of Sec. 20, T11N-R10E. Passes through farm land. Bottom of silt with some areas of sand and gravel. Average depth 18 inches, average width 8 feet.

Kaskaskia River: 4 stations determined and sampled.

Station #2 - Located at the S.W. 1/4 of Sec. 10, T13N-R7E, and passes through Cooks Mill. Bottom of gravel, silt and debris. Average depth 2 ½ feet, average width 40 feet.

Station #2B - Located at the S.W. 1/4 of Sec. 26, T14N-R7E. Passes through farm land. Bottom of silt. Average depth 3 feet, average width 60 feet.

Station #2C - Located at the N.E. 1/4 of Sec. 20, T13N-R7E. Passes through wooded area and farm land. Bottom of silt. Average depth 2 1/2 feet, average width 80 feet.

Station #2D - Located at Sec. 19, T13N-R7E. Passes through farm land. Bottom of silt. Average depth 2 feet, average width 35 feet.

Flat Branch: 6 stations determined and sampled.

Station #69 - Located in the N. 1/2 of Sec. 3, T13N-R8E. Passes through farm land. Bottom of silt. Average depth 6 inches, average width 3 feet.

Station #69A - Located in the S.E. 1/4 of Sec. 3, T13N-R8E. Passes through farm and pasture land. Bottom of sand, gravel, and silt. Average depth one foot, average width 10 feet.

Station #70 - Located in the S.W. 1/4 of Sec. 5, T13N-R8E. Passes through farm land. Bottom of sand and silt. Average depth 18 inches, average width 8 feet.

Station #70A - Located in the S.W. 1/4 Sec. 4, T13N-R8E. Passes through farm land. Bottom of sand and silt. Average depth 2 feet, average width 15 feet.

Station #70B - Located in the N.E. 1/4 of Sec. 4, T13N-R8E. Passes through pasture and farm land. Bottom of silt. Average depth 2 feet, average width 15 feet.

Station #71.- Located in the N.W. 1/4 of Sec. 1, T13N-R7E. Passes through a wooded area containing some farm land. Bottom of silt. Average depth 15 inches, average width 20 feet.

Crabapple Creek: 2 stations determined and sampled.

Station #68A - Located in the N.E. 1/4 of Sec. 32, T13N-R7E. Passes through farm land. Bottom of silt and overgrown in places with aquatic weeds. Average depth 2 1/2 feet, average width 5 feet.

Station #68B - Located in the S.E. 1/4 of Sec. 31, T13N-R7E. Passes through farm land. Bottom of silt approximately 15 inches in depth. Average depth 12 feet, average width 10 feet.

Whitley Creek: 2 stations determined and sampled.

Station #62A - Located in the N.W. 1/4 of Sec. 4, T12N-R7E. Passes through farm land. Bottom of silt. Average depth 18 inches, average width 3 feet.

Station #62B - Located in the N.E. 1/4 of Sec. 4, T12N-R7E. Passes through farm land. Bottom of gravel and silt. Average depth 18 inches, average width 3 feet.

Little Wabash River: 3 stations determined and sampled.

Station #64 - Located in the N.E. 1/4 of Sec. 17, T11N-R7E. Passes through a wooded area containing farm land. Bottom of sand and gravel. Average depth one foot, average width 12 feet.

Station #64A - Located in the S.E. 1/4 of Sec. 8, T11N-R7E. It is due to drainage from Lake Paradise and flows directly into the Little Wabash River. Pases through a wooded area. Bottom of sand and gravel. Average depth 18 inches, average width 25 feet.

Station #64B - Located in the S.W. 1/4 of Sec. 17, T11N-R7E. Passes through farm and pasture land. Bottom of sand and silt. The average depth one foot, average width 20 feet.

Clear Creek: 1 station determined and sampled.

Station #65 - Located in the N.W. 1/4 of Sec. 19, T11N-R7E. Passes through farm land and directly into Lake Mattoon. Bottom of sand, gravel and silt. Average depth 10 inches, average width 6 feet.

APPENDIX C. Total species list by individual stream in Coles County. The numbers proceeding the scientific name indicate the actual numbers collected; the per cent figures following the names indicate the percentage of occurrence in the collections where quantitative data was taken.

Embarrass River

TOTAL NUMBER OF SPECIMENS: 10,661

	Polydontidae--paddlefishes	
1	Polyodon spathula--paddlefish	
	Petromyzontidae--lampreys	
3	Ichthyomyzon castaneus--chestnut lamprey	0.03%
19	Lampetra lamottei--brook lamprey	0.18%
	Lepisosteidae--gars	
31	Lepisosteus osseus--longnose gar	0.29%
1	Lepisosteus platostomus--shortnose gar	0.01%
	Amiidae--bowfins	
3	Amia calva--bowfin	0.03%
	Anguillidae-eels	
1	Anguilla rostrata--American eel	0.01%
	Clupeidae--herrings	
170	Dorosoma cepedianum--gizzard shad	1.59%
	Hiodontidae	
	Hiodon alosoides--goldeye	
	Esocidae--pikes	
25	Esox americanus vermiculatus--grass pickerel	0.23%
	Cyprinidae--minnows and carps	
42	Campostoma anomalum--stoneroller	0.39%
189	Cyprinus carpio--carp	1.77%
627	Ericymba buccata--silverjaw minnow	5.88%
	Hybopsis storeriana--silver chub	
1	Notropis atherinoides--emerald shiner	0.01%
1	Notropis boops--bigeye shiner	0.01%
9	Notropis c. chrysocephalus--striped shiner	0.08%
2	Pimephales p. promelas--no. fathead minnow	0.02%
1,364	Notropis spilopterus--spotfin shiner	12.79%
409	Notropis s. stramineus--ne. sand shiner	3.84%
267	Notropis umbratilis--redfin shiner	2.50%
2,249	Notropis whipplei--steelcolor shiner	21.12%
98	Phenacobius mirabilis	0.92%
1,131	Pimephales notatus--bluntnose minnow	10.61%
553	Pimephales vigilax perspicuus--no. bullhead minnow	5.19%
52	Semotilus atromaculatus--creek chub	0.49%

Embarrass River (Total Species List, Con't)

	Catostomidae--suckers	
21	Carpiodes c. carpio--no. river carpsucker	0.20%
34	Carpiodes cyprinus--quillback	0.32%
28	Carpiodes velifer--highfin carpsucker	0.26%
12	Catostomus commersoni--white sucker	0.11%
8	Erimyzon oblongus claviformis--w. creek chubsucker	0.08%
124	Hypentelium nigricans--no. hog sucker	1.16%
2	Ictiobus bubalus--smallmouth buffalo	0.02%
3	Ictiobus cyprinellus--bigmouth buffalo	0.03%
1	Ictiobus niger--black buffalo	0.01%
60	Minytrema melanops--spotted sucker	0.56%
99	Moxostoma anisurum--silver redhorse	0.93%
253	Moxostoma erythrurum--golden redhorse	2.37%
174	Moxostoma macrolepidotum--no. redhorse	1.63%
2	Moxostoma sp.--redhorse**	0.02%
	Ictaluridae--catfishes and bullhead	
1	Ictalurus melas--black bullhead	0.01%
5	Ictalurus natalis--yellow bullhead	0.05%
100	Ictalurus punctatus--channel catfish	0.94%
67	Noturus miurus--brindled madtom	0.63%
2	Noturus nocturnus--freckled madtom	0.02%
25	Pylodictis olivaris--flathead catfish	0.23%
	Noturus exilis--slender madtom*	
	Aphredoderidae--pirate perches	
2	Aphredoderus sayanus--pirate perch	0.02%
	Cyprinodontidae--topminnows	
61	Fundulus notatus--blackstripe topminnow	0.57%
	Atherinidae--silversides	
667	Labidesthes sicculus--brook silverside	6.26%
	Serranidae--sea basses	
20	Roccus mississippiensis--yellow bass	0.19%
	Centrarchidae--sunfishes	
9	Ambloplites r. rupestris--no. rock bass	0.08%
3	Chaenobryttus gulosus--warmouth	0.03%
40	Lepomis cyanellus--green sunfish	0.38%
14	Lepomis humilis--orangespotted sunfish	0.13%
220	Lepomis m. macrochirus--no. bluegill	2.06%
293	Lepomis megalotis--longear sunfish	2.75%
11	Micropterus dolomieui--smallmouth bass	0.10%

* Probable misidentification
** Probably M. Erythrurum

Embarrass River (Total Species List, Cont)

527	Micropterus p. punctulatus--no. spotted bass	4.94%
15	Micropterus s. salmoides--no. largemouth bass	0.14%
14	Pomoxis annularis--white crappie	0.13%
3	Pomoxis nigromaculatus--black crappie	0.03%
	Percidae--perches and darters	
34	Ammocrypta pellucida--e. sand darter	0.32%
1	Etheostoma asprigene--mud darter	0.01%
27	Etheostoma blennioides--greenside darter	0.25%
17	Etheostoma caeruleum--rainbow darter	0.16%
14	Etheostoma flabellare--fantail darter	0.13%
1	Etheostoma gracile--slough darter	0.01%
143	Etheostoma nigrum--johnny darter	1.34%
9	Etheostoma s. spectabile--orangethroat darter	0.08%
16	Percina caprodes--logperch	0.15%
20	Percina maculata--blackside darter	0.19%
42	Percina phoxocephala--slanderhead darter	0.39%
154	Percina s. sciera--no. dusky darter	1.44%
3	Stizostedion canadense--sauger	0.03%
	Sciaenidae--drums	
12	Aplodinotus grunniens--freshwater drum	0.11%

Kickapoo Creek

TOTAL NUMBER OF SPECIMENS: 7,642

	Petromyzontidae--lampreys	
1	*Ichthyomyzon castaneus*--chestnut lamprey	.01%
	Clupeidae--herrings	
49	*Dorosoma cepedianum*--gizzard shad	.64%
	Cyprinidae--minnows and carps	
487	*Campostoma anomalum*--stoneroller	6.73%
115	*Cyprinus carpio*--carp	
1913	*Ericymba buccata*--silverjaw minnow	25.17%
1	*Notemigonus crysoleucas*--golden shiner	.01%
36	*Notropis c. chrysocephalus*--striped shiner	.47%
223	*Notropis spilopterus*--spotfin shiner	2.91%
278	*Notropis stramineus stramineus*--Ne. sand shiner	3.64%
140	*Notropis umbratilis*--redfin shiner	1.83%
350	*Notropis whipplei*--steelcolor shiner	4.58%
44	*Phenacobius mirabilis*--suckermouth minnow	.57%
1078	*Pimephales notatus*--bluntnose minnow	14.12%
217	*Pimephales p. promelas*--no. fathead minnow	2.84%
29	*Pimephales vigilax perspicuus*-no. bullhead minnow	.38%
1959	*Semotilus atromaculatus*--creek chub	25.24%
	Catostomidae--suckers	
7	*Carpiodes cyprinus*--quillback	.10%
3	*Carpiodes* sp.--carpsucker*	.05%
162	*Catostomus commersoni*--white sucker	2.12%
284	*Erimyzon oblongus claviformis*--w. creek chubsucker	3.66%
7	*Hypentelium nigricans*--northern hog sucker	.09%
15	*Minytrema melanops*--spotted sucker	.20%
7	*Moxostoma macrolepidotum*--northern redhorse	.09%
26	*Moxostoma erythrurum*--golden redhorse	.34%
2	*Moxostoma* sp.--redhorse**	.02%
	Ictaluridae--catfishes and bullheads	
22	*Ictalurus natalis*--yellow bullhead	.29%
16	*Ictalurus punctatus*--channel catfish	.21%
6	*Ictalurus melas*--black bullhead	.07%
3	*Noturus miurus*--brindled madtom	.03%
	Atherinidae--silversides	
5	*Labidesthes sicculus*--brook silverside	.06%
	Cyprinodontidae--topminnows	
6	*Fundulus notatus*--blackstripe topminnow	.08%

* Probably C. *Cyprinus*
** Probably M. *Erythrurum*

Kickapoo Creek (Total species list, con't)

Centrarchidae--sunfishes		
19	*Lepomis cyanellus*--green sunfish	.25%
38	*Lepomis m. macrochirus*--no. bluegill	.50%
20	*Lepomis megalotis*--longear sunfish	
59	*Micropterus p. punctulatus*--no. spotted bass	.77%
1	*Pomoxis annularis*--white crappie	.01%
Percidae--perches and darters		
1	*Etheostoma caeruleum*--rainbow darter	.01%
1	*Etheostoma flabellare*--faintail darter	.01%
4	*Etheostoma nigrum*--johnny darter	.04%
9	*Percina s. sciera*--no. dusky darter	.12%

Polecat Creek (Total species and percentage of occurrence)

TOTAL NUMBER OF SPECIMENS: 6,605

	Clupeidae--herrings	
19	Dorosoma cepedianum--gizzard shad	.29%
	Esocidae--pikes	
77	Esox americanus vermiculatus--grass pickerel	1.17%
	Cyprinidae--minnows and carps	
317	Campostoma anomalum--stoneroller	4.80%
3	Cyprinus carpio--carp	.05%
1432	Ericymba buccata--silverjaw minnow	21.61%
132	Notemigonus crysoleucas--golden shiner	2.00%
188	Notropis c. chrysocephalus--striped shiner	2.85%
57	Notropis spilopterus--spotfin shiner	.86%
65	Notropis s. stramineus--n.e. sand shiner	.98%
801	Notropis umbratilis--redfin shiner	12.13%
62	Notropis whipplei--steelcolor shiner	.94%
18	Phenacobius mirabilis--suckermouth minnow	.27%
1178	Pimephales notatus--bluntnose minnow	17.83%
11	Pimephales p. promelas--no. fathead minnow	.17%
3	Pimephales vigilax perspicuus--no. bullhead minnow	.05%
529	Semotilus atromaculatus--creekchub	8.01%
	Catostomidae--suckers	
19	Carpiodes cyprinus--quillback	.29%
46	Carpiodes sp.--carpsucker*	.73%
31	Catostomus commersoni--white sucker	.47%
64	Erimyzon oblongus claviformis--w. creek chubsucker	.97%
24	Hypentelium nigricans--no. hog sucker	.36%
10	Minytrema melanops--spotted sucker	.15%
20	Moxostoma erythrurum--golden redhorse	.30%
1	Moxostoma anisurum--silver redhorse	.02%
36	Moxostoma sp.--redhorse**	.55%
	Ictaluridae--catfishes and bullheads	
8	Ictalurus melas--black bullhead	.12%
30	Ictalurus natalis--yellow bullhead	.45%
69	Noturus miurus--brindled madtom	1.04%
	Aphredoderidae--pirate perches	
24	Aphredoderus sayanus--pirate perch	.36%
	Cyprinodontidae--topminnows	
478	Fundulus notatus--blackstrope topminnow	7.24%

* Probably C. Cyprinus
** Probably M. Erythrurum

Polecat Creek (Total species list, con't)

	Atherinidae--silversides	
126	Labidesthes sicculus--brook silverside	1.91%
	Centrarchidae--sunfishes	
18	Lepomis cyanellus--green sunfish	.27%
58	Lepomis m. macrochirus--no. bluegill	.88%
123	Lepomis megalotis--longear sunfish	1.86%
52	Micropterus p. punctulatus--no. spotted bass	.79%
7	Micropterus s. salmoides--no. largemouth bass	.11%
1	Pomoxis annularis--white crappie	.02%
	Percidae--perches and darters	
72	Etheostoma blennioides--greenside darter	1.09%
131	Etheostoma caeruleum--rainbow darter	1.98%
19	Etheostoma flabellare- fantail darter	.29%
238	Etheostoma nigrum--johnny darter	3.60%
7	Etheostoma s. spectabile--orangethroat darter	.11%
2	Percina caprodes--logperch	.03%

Riley Creek (Total species list and percentage of occurrence)

TOTAL NUMBER OF SPECIMENS: 512

Cyprinidae--minnows and carps		
17	*Campostoma anomalum*--stoneroller	3.32%
70	*Notropis umbratilis*--redfin shiner	13.67%
1	*Phenacobius mirabilis*--suckermouth minnow	.20%
254	*Pimephales notatus*--bluntnose minnow	49.11%
22	*Pimephales p. promelas*--no. fathead minnow	4.29%
31	*Semotilus atromaculatus*--creekchub	6.05%
Catostomidae--suckers		
9	*Erimyzon oblongus claviformis*--w. creek chubsucker	1.76%
1	*Catostomus commersoni*--white sucker	.20%
Cyprinodontidae--topminnows		
28	*Fundulus notatus*--blackstripe topminnow	5.47%
Percidae--perches and darters		
67	*Etheostoma nigrum*--johnny darter	
Clupeidae--herrings		
2	*Dorosoma cepedianum*--gizzard shad	.39%
Centrarchidae--sunfishes		
11	*Lepomis cyanellus*--green sunfish	2.15%
1	*Lepomis megalotis*--longear sunfish	.20%
Ictaluridae--catfishes and bullheads		
2	*Ictalurus melas*--black bullhead	.39%

Whtestone Creek (Total species list and percentage of occurrence)

TOTAL NUMBER OF SPECIMENS: 6,108

	Cyprinidae--minnows and carps	
520	Campostoma anomalum--stoneroller	8.51%
2774	Ericymba buccata--silverjaw minnow	45.51%
6	Notropis c. chrysocephalus--striped shiner	.10%
2	Notropis s. stramineus--n.e. sand sniner	.03%
10	Notropis umbratilis--redfin shiner	.16%
1261	Pimephales notatus--bluntnose minnow	20.65%
144	Pimephales p. promelas--no. fathead minnow	2.36%
881	Semotilus atromaculatus--creek chub	14.42%
	Catostomidae--suckers	
382	Carpiodes sp.--carpsuckers*	6.25%
9	Catostomus commersoni--white sucker	.15%
29	Erimyzon oblongus claviformis--w. creek chubsucker	.47%
	Centrarchidae--sunfishes	
4	Lepomis cyanellus--green sunfish	.06%
15	Lepomis m. macrochirus--no. bluegill	.19%
3	Lepomis megalotis--longear sunfish	.05%
6	Micropterus p. punctulatus--no. spotted bass	.10%
3	Micropterus s. salmoides--no. largemouth bass	.10%
	Percidae--perches and darters	
57	Etheostoma nigrum--johnny darter	.93%
1	Etheostoma s. spectabile--orangethroat darter	.02%

* Probably C. Cyprinus

Indian Creek (Total species list and percentage of occurrence)

TOTAL NUMBER OF SPECIMENS: 3, 148

	Cyprinidae--minnows and carps	
398	Campostoma anomalum--stoneroller	12.64%
1'56	Erscymba buccata--silverjaw minnow	62.21%
25	Notropis c. chrysocephalus--striped shiner	.79%
22	Notropis s. stramineus--n.e. sand shiner	.70%
34	Notropis umbratilis--redfin shiner	1.08%
139	Pimephales notatus--bluntnose minnow	4.42%
6	Pimephales p. promelas--no. fathead minnow	.19%
418	Semotilus atromaculatus--creek chub	13.28%
44	Notropis spilopterus--spotfin shiner	1.40%
42	Notropis whipplei--steelcolor shiner	1.33%
	Catostomidae--suckers	
22	Carpiodes sp.--carpsucker*	.70%
12	Erimyzon oblongus claviformis--w. creek chubsucker	.38%
7	Hyrtentelium nigricans--no. hog sucker	.22%
2	Catostomus commersoni--white sucker	.06%
2	Moxostoma sp.--redhorse**	.06%
	Centrarchidae--sunfishes	
2	Lepomis cyanellus--green sunfish	.06%
4	Micropterus p. punctulatus--no. spotted bass	.13%
	Percidae--perches and darters	
3	Etheostoma caeruleum--rainbow darter	.10%
6	Etheostoma s. spectabile--orangethroat darter	.19%
2	Etheostoma nigrum--johnny darter	.06%

* Probably C. cyprinus
** Probably M. erythrurum

Union Drainage District #3 (Total species list and percentage of occurrence)

TOTAL NUMBER OF SPECIMENS: 2,790

	Clupeidae--herrings	
1	Dorosoma cepedianum--gizzard shad	0.04%
	Cyprinidae--minnows and carps	
329	Campostoma anomalum--stoneroller	11.81%
7	Cyprinus carpio-carp	0.28%
349	Ericymba buccata--silverjaw minnow	12.53%
67	Notropis c. chrysocephalus--striped shiner	2.40%
332	Notropis umbratilis--redfin shiner	11.92%
3	Notropis whipplei--steelcolor shiner	0.12%
1	Notropis spilopterus--spotfin shiner	0.04%
3	Phenacobius mirabilis--suckermouth minnow	0.12%
454	Pimephales notatus--bluntnose minnow	16.90%
2	Pimephales vigilax perspicuus--no. bullhead minnow	0.07%
395	Pimephales p. promelas--No. fathead minnow	14.69%
557	Semotilus atromaculatus--creek chub	21.21%
	Catostomidae--suckers	
20	Catostomus commersoni--white sucker	0.72%
54	Erimyzon oblongus claviformis--w. creek chubsucker	1.94%
1	Hypentelium nigricans--no. hog sucker	0.04%
1	Minytrema melanops--spotted sucker	0.04%
4	Moxostoma erythrurum--golden redhorse	0.14%
1	Moxostoma anisurum--silver redhorse	0.04%
	Ictaluridae--catfishes and bullheads	
2	Ictalurus natalis--yellow bullhead	0.07%
	Cyprinodontidae--topminnows	
54	Fundulus notatus--blackstripe topminnow	1.94%
	Atherinidae--silversides	
17	Labidesthes sicculus--brook silverside	0.61%
	Centrarchidae--sunfishes	
2	Lepomis cyanellus--green sunfish	0.07%
8	Lepomis m. macrochirus--no. bluegill	0.29%
39	Lepomis megalotis--longear sunfish	1.40%
11	Micropterus p. punctulatus--no. spotted bass	0.39%
	Percidae--perches and darters	
13	Etheostoma nigrum--johnny darter	0.47%
3	Etheostoma flabellare--fantail darter	0.12%

Little Embarrass River (Total species list and percentage of occurrence)

TOTAL NUMBER OF SPECIMENS: 4,565

	Clupeidae--herrings	
12	Dorosoma cepedianum--gizzard shad	0.26%
	Esocidae--pikes	
29	Esox americanus vermiculatus--grass pickerel	0.64%
	Cyprinidae--minnows and carps	
9	Campostoma anomalum--stoneroller	0.18%
420	Ericymba buccata--silverjaw minnow	9.20%
270	Notropis c. chrysocephalus--striped shiner	5.91%
1	Notropis atherinoides--emerald shiner	0.02%
	Notropis lutrensis--red shiner*	
249	Notropis spilopterus--spotfin shiner	5.45%
39	Notropis s. stramineus--n.e. sand shiner	0.85%
1511	Notropis umbratilis--redfin shiner	33.16%
322	Notropis whipplei--steelcolor shiner	7.05%
894	Pimephales notatus--bluntnose minnow	19.58%
83	Semotilus atromaculatus--creek chub	1.82%
	Catostomidae--suckers	
44	Catostomus commersoni--white sucker	
57	Erimyzon oblongus claviformis--w. creek chubsucker	1.25%
32	Hypentelium nigricans--no. hog sucker	0.70%
3	Minytrema melanops--spotted sucker	0.06%
43	Moxostoma erythrurum--golden redhorse	0.94%
1	Moxostoma anisurum--silver redhorse	0.02%
12	Moxostoma macrolepidotum--no. redhorse	0.26%
1	Carpiodes cyprinus--quillback carpsucker	0.02%
	Ictaluridae--catfishes and bullheads	
1	Ictalurus natalis--yellow bullhead	0.02%
66	Noturus miurus--brindled madtom	1.45%
	Aphredoderidae--pirateperch	
4	Aphredoderus sayanus--pirate perch	0.08%
	Cyprinodontidae--topminnows	
26	Fundulus notatus--blackstripe topminnow	0.57%
	Atherinidae--silversides	
10	Labidesthes sicculus--brook silverside	0.22%

*Probable misidentification

Little Embarrass River (Total species list, con't)

	Centrarchidae--sunfishes	
9	Lepomis cyanellus--green sunfish	0.20%
20	Lepomis m. macrochirus--no. bluegill	0.44%
118	Lepomis megalotis--longear sunfish	2.58%
19	Micropterus p. punctulatus--no. spotted bass	0.42%
1	Micropterus s. salmoides--no. largemouth bass	0.02%
	Percidae--perches and darters	
3	Etheostoma blennioides--greenside darter	0.06%
6	Etheostoma caeruleum--rainbow darter	0.12%
211	Etheostoma nigrum--johnny darter	4.62%
3	Percina caprodes--logperch	0.06%
38	Percina maculata--blackside darter	0.83%

Cassell Creek (Total species list and percentage of occurrence)

TOTAL NUMBER OF SPECIMENS: 8,673

	Clupeidae--herrings	
5	Dorosoma cepedianum--gizzard shad	0.06%
	Esocidae--pikes	
9	Esox americanus vermiculatus--grass pickerel	0.10%
	Cyprinidae--minnows and carps	
545	Campostoma anomalum--stoneroller	6.28%
6	Cyprinus carpio--carp	0.07%
125	Ericymba buccata--silverjaw minnow	1.44%
7	Notropis c. chrysocephalus--striped shiner	0.08%
2	Notropis s. stramineus--n.e. sand shiner	0.02%
819	Notropis umbratilis--redfin shiner	9.44%
6	Notropis whipplei--steelcolor shiner	0.07%
2	Phenacobius mirabilis--suckermouth minnow	0.02%
2284	Pimephales notatus--bluntnose minnow	26.52%
2284	Pimephales p. promelas--no. fathead minnow	26.52%
1636	Semotilus atromaculatus--creek chub	18,88%
1	Notemigonus crysoleucas--golden shiner	0.01%
	Catostomidae--suckers	
1	Carpiodes cyprinus--quillback	0.01%
1	Carpiodes sp.--carpsucker*	0.01%
87	Catostomus commersoni--white sucker	1.00%
104	Erimyzon oblongus claviformis--w. creek chubsucker	1.20%
1	Hypentelium nigricans--no. hog sucker	0.01%
1	Moxostoma anisurum--silver redhorse	0.01%
	Ictaluridae--catfishes and bullheads	
12	Ictalurus melas--black bullhead	0.14%
35	Ictalurus natalis--yellow bullhead	0.40%
	Cyprinodontidae--topminnows	
376	Fundulus notatus--blackstripe topminnow	4.34%
	Centrarchidae--sunfishes	
68	Lepomis cyanellus--green sunfish	0.78%
8	Lepomis m. macrochirus--no. bluegill	0.09%
41	Lepomis megalotis--longear sunfish	0.47%
11	Micropterus p. punctulatus--no. spotted bass	0.13%
	Percidae--perches and darters	
165	Etheostoma nigrum--johnny darter	1.90%
1	Percina maculata--blackside darter	0.01%

*Probably C. Cyprinus

Greasy Creek (Total species list and percentage of occurrence)

TOTAL NUMBER OF SPECIMENS: 3,219

	Clupeidae--herrings	
	Dorosoma cepedianum--gizzard shad	
	Esocidae--pikes	
29	*Esox americanus vermiculatus*--grass pickerel	0.90%
	Cyprinidae--minnows and carps	
374	*Campostoma anomalum*--stoneroller	11.62%
173	*Ericymba buccata*--silverjaw minnow	5.37%
32	*Notropis c. chrysocephalus*--striped shiner	0.99%
98	*Notropis spilopterus*--spotfin	3.04%
219	*Notropis umbratilis*--redfin shiner	6.80%
64	*Notropis whipplei*--steelcolor shiner	1.99%
1	*Notropis s. stramineus*--n.e. sand shiner	0.03%
1073	*Pimephales notatus*--bluntnose minnow	33.33%
16	*Pimephales p. promelas*--no. fathead minnow	0.50%
1	*Phenacobius mirabilis*--suckermouth minnow	0.03%
619	*Semotilus atromaculatus*--creek chub	19.27%
	Catostomidae--suckers	
30	*Catostomus commersoni*--white sucker	0.93%
103	*Erimyzon oblongus claviformis*--w. creek chubsucker	3.20%
7	*Hypentelium nigricans*--northern hog sucker	0.22%
1	*Minytrema melanops*--spotted sucker	0.03%
3	*Moxostoma erythrurum*--golden redhorse	0.09%
10	*Moxostoma* sp.--redhorse*	0.31%
	Ictaluridae--catfishes and bullheads	
4	*Ictalurus melas*--black bullhead	0.12%
5	*Ictalurus natalis*--yellow bullhead	0.15%
3	*Noturus miurus*--brindled madtom	0.09%
	Aphredoderidae--pirate perches	
2	*Aphredoderus sayanus*--pirate perch	0.06%
	Cyprinodontidae--topminnows	
44	*Fundulus notatus*--blackstripe topminnow	1.37%
	Centrarchidae--sunfishes	
4	*Lepomis cyanellus*--green sunfish	0.12%
30	*Lepomis m. macrochirus*--northern bluegill	0.93%
40	*Lepomis megalotis*--longear sunfish	
2	*Micropterus p. punctulatus*--no. spotted bass	0.06%
1	*Micropterus s. salmoides*--no. largemouth bass	0.03%

*Probably *M. Erythrurum*

Greasy Creek (Total species list con't)

Percidae--perches and darters

7	Percina maculata--blackside darter	0.22%
7	Etheostoma caeruleum--rainbow darter	0.22%
217	Etheostoma nigrum--johnny darter	6.74%

Hog Creek (Total species list and percentage of occurrence)

TOTAL NUMBER OF SPECIMENS: 653

Esocidae--pikes
22 Esox americanus vermiculatus--grass pickerel 3.37%

Cyprinidae--minnows and carps
39 Notemigonus crysoleucas--golden shiner 5.97%
17 Notropis umbratilis--redfin shiner 2.60%
8 Notropis whipplei--steelcolor shiner 1.23%
1 Pimephales p. promelas--no. fathead minnow 0.15%
2 Pimephales notatus--bluntnose minnow 0.30%

Catostomidae--suckers
45 Erimyzon oblongus claviformis--w. creek chubsucker 6.91%

Ictaluridae--catfishes and bullheads
16 Ictalurus melas--black bullhead 2.45%

Aphredoderidae--pirate perch
45 Aphredoderus sayanus--pirate perch 6.89%

Cyprinodontidae--topminnows
72 Fundulus notatus--blackstripe topminnow 11.03%

Centrarchidae--sunfishes
181 Lepomis cyanellus--green sunfish 27.72%
148 Lepomis m. macrochirus--no. bluegill 22.66%
6 Lepomis humilis--orangespotted sunfish 0.92%

Hog Creek (Total species list and percentage of occurrence)

TOTAL NUMBER OF SPECIMENS: 653

	Esocidae--pikes	
22	Esox americanus vermiculatus--grass pickerel	3.37%
	Cyprinidae--minnows and carps	
39	Notemigonus crysoleucas--golden shiner	5.97%
17	Notropis umbratilis--redfin shiner	2.60%
8	Notropis whipplei--steelcolor shiner	1.23%
1	Pimephales p. promelas--no. fathead minnow	0.15%
2	Pimephales notatus--bluntnose minnow	0.30%
	Catostomidae--suckers	
45	Erimyzon oblongus claviformis--w. creek chubsucker	6.91%
	Ictaluridae--catfishes and bullheads	
16	Ictalurus melas--black bullhead	2.45%
	Aphredoderidae--pirate perch	
45	Aphredoderus sayanus--pirate perch	6.89%
	Cyprinodontidae--topminnows	
72	Fundulus notatus--blackstripe topminnow	11.03%
	Centrarchidae--sunfishes	
181	Lepomis cyanellus--green sunfish	27.72%
148	Lepomis m. macrochirus--no. bluegill	22.66%
6	Lepomis humilis--orangespotted sunfish	0.92%

West Branch - Hurricane Creek (Total species and percentage of occurrence)

TOTAL NUMBER OR SPECIMENS: 3, 477

	Cyprinidae--minnows and carps	
132	Campostoma anomalum--stoneroller	3.78%
1319	Erimyzba buccata--silverjaw minnow	37.68%
249	Notropis c. chrysocephalus--striped shiner	7.16%
8	Notropis spilopterus--spotfin shiner	.23%
171	Notropis s. stramineus--N.E. sand shiner	4.92%
140	Notropis umbratilis--redfin shiner	4.03%
2	Notropis whipplei--steelcolor shiner	.06%
1	Phenacobius mirabilis--suckermouth minnow	.03%
772	Pimephales notatus--bluntnose minnow	22.20%
319	Semotilus atromaculatus--creekchub	9.17%
	Catostomidae--suckers	
15	Carpiodes carpio carpio--no. river carpsucker	.43%
7	Catostomus commersoni--white sucker	.20%
11	Erimyzon oblongus claviformis--w. creek chubsucker	.32%
2	Hypentelium nigricans--no. hog sucker	.06%
	Moxostoma erythrurum--golden redhorse*	
4	Moxstoma sp.--redhorse**	.12%
	Ictaluridae--catfishes and bullheads	
	Ictalurus melas--black bullhead*	
2	Ictalurus natalis--yellow bullhead	
	Cyprinodontidae--topminnows	
26	Fundulus notatus--black stripe topminnow	.75%
	Centrarchidae--sunfishes	
17	Lepomis cyanellus--green sunfish	.49%
4	Lepomis m. macrochirus--northern bluegill	.12%
13	Lepomis megalotis--longear sunfish	.37%
25	Micropterus p. punctulatus--no. spotted bass	.72%
2	Micropterus s. salmoides--no. largemouth bass	.06%
	Percidae--perches and darters	
	Etheostoma blennioides--greenside darter*	
7	Etheostoma caeruleum--rainbow darter	.20%
120	Etheostoma nigrum--johnny darter	3.45%
118	Etheostoma s. spectabile--orangethroat darter	3.39%

*Species were collected in Cumberland County within 2 miles of Coles County border.

**Probably M. Erythrurum

East Branch (Total species list and percentage of occurrence)

TOTAL NUMBER OF SPECIMENS: 4,398

	Cyprinidae--minnows and carps	
447	Campostoma anomalum--stoneroller	10.16%
813	Ericymba buccata--silverjaw minnow	18.49%
164	Notropis c. chrysocephalus--striped shiner	3.73%
6	Notropis spilopterus--spotfin shiner	.14%
482	Notropis stramineus stramineus--n.e. sand shiner	10.96%
191	Notropis umbratilis--redfin shiner	4.34%
17	Phenacobius mirabilis--suckermouth minnow	.39%
1268	Pimephales notatus--bluntnose minnow	28.76%
357	Semotilus atromaculatus--creekchub	8.18%
	Catostomidae--suckers	
77	Erimyzon oblongus claviformis--w. creek chubsucker	1.75%
2	Moxostoma sp.--redhorse*	.05%
	Cyprinodontidae--topminnows	
216	Fundulus notatus--blackstripe topminnow	4.91%
	Centrarchidae--sunfishes	
3	Lepomis cyanellus--green sunfish	
20	Lepomis m. macrochirus--no. bluegill	.45%
47	Lepomis megalotis--longear sunfish	1.07%
8	Micropterus p. punctulatus--no. spotted bass	.18%
	Percidae--perches and darters	
94	Etheostoma nigrum--johnny darter	2.14%
186	Etheostoma s. spectabile--orangethroat darter	4.23%

*Probably M. Erythrurum

Opossum Creek (Total species list and percentage of occurrence)

TOTAL NUMBER OF SPECIMENS: 422

Cyprinidae--minnows and carps		
71	*Campostoma anomalum*--stoneroller	16.8%
24	*Ericymba buccata*--silverjaw minnow	5.7%
18	*Notropis umbratilis*--redfin shiner	4.3%
48	*Pimephales notatus*--bluntnose minnow	11.4%
176	*Semotilus atromaculatus*--creek chub	41.7%
2	*Notropis c. chrysocephalus*--striped shiner	.5%
Castostomidae--suckers		
54	*Erimyzon oblongus claviformis*--w. creek chubsucker	12.8%
Centrarchidae--sunfishes		
6	*Lepomis cyanellus*--green sunfish	
	Lepomis m. macrochirus--no. bluegill	1.4%
Percidae--perches and darters		
13	*Etheostoma s. spectabile*--orangethroat darter	3.1%
Cyprinodontiade--topminnows		
10	*Fundulus notatus*--blackstripe topminnow	2.3%

Kaskaskia River (Total species list and percentage of occurrence)

TOTAL NUMBER OF SPECIMENS: 281

Lepisosteidae--gars		
1	*Lepisosteus osseus*--longnose gar	.3%
Clupeidae--herrings		
2	*Dorosoma cepedianum*--gizzard shad	.7%
Esocidae--pikes		
9	*Esox americanus vermiculatus*--grass pickerel	3.2%
Cyprinidae--minnows and carps		
1	*Campostoma anomalum*--stoneroller	.3%
21	*Hybognathus nuchalis nuchalis*--w. silvery minnow	7.5%
4	*Notemigonus crysoleucas*--golden shiner	1.4%
5	*Notropis c. chrysocephalus*--striped shiner	1.8%
36	*Notropis lutrensis*--red shiner	2.8%
53	*Notropis umbratilis*--redfin shiner	18.5%
68	*Pimephales notatus*--bluntnose minnow	24.1%
Catostomidae--suckers		
2	*Erimyzon oblongus claviformis*--w. creek chubsucker	.7%
1	*Ictiobus bubalus*--smallmouth buffalo	.3%
4	*Moxostoma erythrurum*--golden redhorse	1.4%
Ictaluridae--catfishes and bullheads		
3	*Noturus gyrinus*--tadpole madtom	1.1%
2	*Noturus miurus*--brindled madtom	.7%
2	*Noturus nocturnus*--freckled madtom	.7%
Cyprinodontidae--topminnows		
1	*Fundulus notatus*--blackstripe topminnow	6.1%
Centrarchidae--sunfishes		
1	*Ambloplites r. rupestris*--no. rock bass	.3%
9	*Lepomis cyanellus*--green sunfish	3.2%
5	*Lepomis m. macrochirus*--no. bluegill	1.8%
15	*Lepomis megalotis*--longear sunfish	5.4%
Percidae--perches and darters		
2	*Etheostoma caeruleum*--rainbow darter	.7%
4	*Etheostoma nigrum*--johnny darter	1.4%
1	*Percina caprodes*--logperch	.3%
6	*Percina maculata*--blackside darter	2.1%
7	*Percina phoxocephala*--slenderhead darter	2.5%

Flat Branch (Total species list and percentage of occurrence)

TOTAL NUMBER OF SPECIMENS: 3835

	Esocidae--pikes	
40	Esox americanus vermiculatus--grass pickerel	1.04%
	Cyprinidae--minnows and carps	
4	Ericymba buccata--silverjaw minnow	.10%
40	Hybognathus n. nuchalis--w. silvery minnow	1.04%
2	Nocomis biguttata--horny head chub	.05%
90	Notemigonus crysoleucas--golden shiner	2.35%
131	Notropis c. chrysocephalus--striped shiner	3.42%
6	Notropis dorsalis--bigmouth shiner	.16%
595	Notropis lutrensis--red shiner	15.51%
2	Notropis spilopterus--spotfin shiner	.05%
85	Notropis s. stramineus--n.e. sand shiner	2.22%
829	Notropis umbratilis--redfin shiner	21.65%
4	Phenacobius mirabilis--suckermouth minnow	.10%
1111	Pimephales notatus--bluntnose minnow	28.47%
1	Pimephales p. promelas--northern fathead minnow	.01%
10	Semotilus atromaculatus--creek chub	.26%
2	Cyprinus carpio--carp	.05%
	Catostomidae--suckers	
9	Moxostoma erythrurum--golden redhorse	.23
4	Catostomus commersoni--white sucker	.10%
77	Erimyzon oblongus claviformis--w. creek chubsucker	2.01%
	Ictaluridae--catfishes and bullheads	
13	Ictalurus melas--black bullhead	.34%
12	Ictalurus natalis--yellow bullhead	.31%
7	Noturus gyrinus--tadpole madtom	.18%
2	Noturus nocturnus--freckled madtom	.05%
	Aphredoderidae--pirate perches	
7	Aphredoderus sayanus--pirate perch	.18%
	Cyprinodontidae--topminnows	
497	Fundulus notatus--Blackstripe topminnow	12.99%
	Centrarchidae--sunfishes	
15	Lepomis humilis--orangespotted sunfish	.40%
95	Lepomis cyanellus--green sunfish	2.48%
27	Lepomis m. macrochirus--no. bluegill	.70%
54	Lepomis megalotis--longear sunfish	1.41%
2	Micropterus p. punctulatus--no. spotted bass	.05%
1	Micropterus s. salmoides--northern largemouth bass	.01%
8	Pomoxis annularis--white crappie	.21%
	Percidae--perches and darters	
65	Etheostoma nigrum--johnny darter	1.69%
3	Percina maculata--blackside darter	.08%

Crabapple Creek (Total species list and percentage of occurrence)

TOTAL NUMBER OF SPECIMENS: 796

	Esocidae--pikes	
1	*Esox americanus vermiculatus*--grass pickerel	.13%
	Cyprinidae-minnows and carps	
2	*Campostoma anomalum*--stoneroller	.26%
4	*Cyprinus carpio*--carp	.50%
6	*Hybognathus n. nuchalis*--w. silvery minnow	.75%
22	*Notemigonus crysoleucas*--golden shiner	2.76%
8	*Notropis c. chrysocephalus*--striped shiner	1.00%
76	*Notropis lutrensis*--red shiner	9.65%
2	*Notropis stramineus stramineus*--n.e. sand shiner	.26%
187	*Notropis umbratilis*--redfin shiner	23.94%
1	*Notropis spilopterus*--spotfin shiner	.13%
149	*Pimephales notatus*--bluntnose minnow	18.97%
2	*Pimephales p. promelas*--no. fathead minnow	.26%
25	*Semotilus atromaculatus*--creek chub	3.14%
	Catostomidae--suckers	
79	*Catostomus commersoni*--white sucker	9.92%
19	*Erimyzon oblongus claviformis*--w. creek chubsucker	2.39%
1	*Moxostoma erythrurum*--golden redhorse	.13%
	Ictaluridae--catfishes and bullheads	
5	*Ictalurus melas*--black bullhead	.63%
3	*Ictalurus natalis*--yellow bullhead	.38%
	Cyprinodontidae--topminnows	
38	*Fundulus notatus*--blackstripe topminnow	4.77%
	Aphredoderidae--pirate perches	
14	*Aphredoderus sayanus*--pirate perch	1.76%
	Centrarchidae--sunfishes	
6	*Lepomis cyanellus*--green sunfish	.75%
2	*Lepomis m. macrochirus*--no. bluegill	.26%
18	*Lepomis megalotis*--longear sunfish	2.26%
	Percidae--perches and darters	
127	*Etheostoma nigrum*--johnny darter	15.95%

Whitley Creek (Total species list and percentage of occurrence)

TOTAL NUMBER OF SPECIMENS: 474

Cyprinidae--minnows and carps		
79	Notemigonus crysoleucas -golden shiner	16.67%
3	Notropis lutrensis--red shiner	.63%
34	Notropis umbratilis--redfin shiner	7.17%
32	Notropis s. stramineus--n.e. sand shiner	6.75%
19	Pimephales notatus--bluntonse minnow	4.01%
188	Pimephales p. promelas--northern fathead minnow	39.67%
41	Semotilus atromaculatus--creek chub	8.65%
Catostomidae--suckers		
4	Erimyzon oblongus claviformis--w. creek chubsucker	.84%
1	Catostomus commersoni--white sucker	.21%
Ictaluridae--catfishes and bullheads		
7	Ictalurus melas--black bullhead	1.48%
2	Ictalurus natalis--yellow bullhead	.42%
Aphredoderidae--pirate perches		
2	Aphredoderus sayanus--pirate perch	.42%
Centrarchidae--sunfishes		
22	Lepomis cyanellus--green sunfish	4.64%
40	Lepomis m. macrochirus--northern bluegill	8.44%

Little Wabash River (Total species list and percentage of occurrence)

TOTAL NUMBER OF SPECIMENS: 412

	Clupeidae--herrings	
9	*Dorosoma cepedianum*--gizzard shad	2.18%
	Esocidae--pikes	
2	*Esox americanus vermiculatus*--grass pickerel	0.49%
	Cyprinidae--minnows and carps	
8	*Cyprinus carpio*--carp	1.94%
1	*Notropis s. stramineus*--n. e. sand shiner	0.24%
105	*Notropis umbratilis*--redfin shiner	25.89%
26	*Notropis whipplei*--steelcolor shiner	6.41%
28	*Notropis s. spilopterus*--spotfin shiner	6.81%
1	*Semotilus atromaculatus*--creek chub	0.24%
	Catostomidae--suckers	
2	*Moxostoma erythrurum*--golden redhorse	0.49%
	Ictaluridae--catfishes and bullheads	
6	*Ictalurus melas*--black bullhead	1.46%
	Cyprinodontidae--topminnows	
17	*Fundulus notatus*--blackstripe topminnow	4.13%
	Centrarchidae--sunfishes	
18	*Lepomis cyannellus*--green sunfish	4.37%
73	*Lepomis m. macrochirus*--no. bluegill	17.72%
5	*Lepomis megalotis*--longear sunfish	1.21%
6	*Lepomis humilis*--orangespotted sunfish	1.46%
89	*Pomoxis annularis*--white crappie	21.80%
2	*Micropterus p. punctulatus*--no. spotted bass	0.49%
5	*Micropterus s. salmoides*--no. largemouth bass	1.21%
	Percidae--perches and darters	
6	*Etheostoma nigrum*--johnny darter	1.46%

Clear Creek (total species list and percentage of occurrence)

TOTAL NUMBER OF SPECIMENS: 767

Cyprinidae-minnows and carps		
351	*Campostoma anomalum*--stoneroller	48.40%
1	*Cyprinus carpio*--carp	0.10%
135	*Ericymba buccata*--silverjaw minnow	17.60%
1	*Notropis spilopterus*--spotfin shiner	0.10%
4	*Notropis s. stramineus*--n.e. sand shiner	0.50%
116	*Semotilus atromaculatus*--creek chub	15.10%
Catostomidae--suckers		
19	*Catostomus commersoni*--white sucker	2.50%
21	*Erimyzon oblongus claviformis*--w. creek chubsucker	2.70%
Ictaluridae--catfishes and bullheads		
1	*Ictalurus melas*--black bullhead	0.10%
1	*Ictalurus natalis*--yellow bullhead	0.10%
Cyprinodontidae--topminnows		
75	*Fundulus notatus*--blackstripe topmonnow	9.80%
Centrarchidae--sunfishes		
9	*Lepomis cyanellus*--green sunfish	1.20%
17	*Lepomis m. macrochirus*- no. bluegill	2.30%
2	*Lepomis megalotis*--long ar sunfish	0.20%
5	*Micropterus p. punctulatus*--no. spotted bass	0.50%
1	*Pomoxis annularis*--white crappie	0.10%
Percidae--perches and darters		
8	*Etheostoma s. spectabile*--orangethroat darter	1.10%

APPENDIX D. Chemical and Physical Data from Each Stream By Station and Date.

Body of Water--Embarrass River

Station Number	Date	Water Temp. C	Air Temp. C	D.O. ppm	Turbidity jtu	NO_3 ppm	NO_2 ppm
G	9/11/67	20	23	9.0	30	0.54	0.026
A	9/ 4/68	21	20	8.7	45	8.8	-
B	9/ 4/68	21	20	8.6	10	4.4	-
C	9/ 6/68	20	20	7.0	25	4.0	-
G	9/16/68	17	20	8.0	60	8.0	0.03
G	9/23/68	19	25	9.0	30	13.2	-
H	9/16/68	18	19	8.5	25	4.0	1.0
I	9/10/68	18	17	7.5	5	-	0.17
A	3/17/69	4.0	5.0	12.0	15	28.0	0.41
A	8/29/69	-	-	-	45	0	0
B	8/28/69	-	-	-	55	30.4	0
C	3/17/69	4.0	5.0	11.0	0	19.8	2.89
C	8/20/69	-	-	-	40	0	0
D	8/20/69	-	-	-	40	0	0
E	7/31/69	-	29.4	-	15.0	0	0
F	7/31/69	-	29.4	-	30	0	0
G	3/17/69	7.0	16.5	10.0	0.5	4.4	5.36
G	7/31/69	-	29.4	-	65	0	0
G	3/18/70	3.0	-	10.0	-	-	0.08
G	3/23/70	5.5	-	13.5*	-	13.1	0.08
G	3/30/70	5.5	-	-	-	21.9	0.10
G	4/ 6/70	9.5	-	-	-	16.3	0.23
G	4/13/70	14.0	-	-	-	22.9	0.15
G	4/20/70	9.4	-	-	-	16.4	0.11
G	4/27/70	12/7	-	-	-	16.3	0.19
H	5/ 4/70	15.0	-	-	-	19.6	0.20
H	3/18/70	3.0	-	9.0	-	-	0.23
H	3/23/70	6.0	-	11.8	-	12.9	0.35
H	3/30/70	5.5	-	-	-	16.6	0.17
H	4/ 6/70	9.5	-	-	-	16.3	0.23
H	4/13/70	13.0	-	-	-	13.8	0.46
H	4/27/70	12.7	-	-	-	21.8	0.18
H	5/ 4/70	12.5	-	-	-	18.4	0.33
H_2	8/ 7/69	-	-	-	85	17.6	0.13
I	3/17/69	7.0	17.0	10.0	55	26.4	4.95
I	8/ 7/69	-	-	-	50	13.2	0.17
H	5/ 4/69	15.0	-	-	-	19.6	0.20
H	3/17/69	7.0	10.0	10.5	20	22.0	5.36
H	8/ 7/69	-	-	-	50	13.2	0.46

* 100% saturation

Body of Water--Embarrass River (cont)

Station Number	PO_4 ppm	SO_4 ppm	pH	Hardness Ca ppm	Hardness Total ppm	CO_2 ppm	BOD ppm
G	0.5	45	7.5	110	240	4	
A	0.5	55	8.55	260	450	-	
B	0.6	55	8.5	260	450	-	
C	0.4	-	8.3	260	470	-	
G	0.4	-	8.7	150	340	-	
G	0.25	38	8.5	210	380	-	
H	2.5	-	8.5	240	410	-	
I	4.20	47	8.4	240	410	-	
A	1.0	60	8.3	260	450	-	
A	0.9	50	8.7	-	-	-	
B	0.9	45	8.8	-	-	-	
C	0.4	70	7.7	270	490	-	
C	0.4	45	8.5	-	-	-	
D	0.9	35	8.3	-	-	-	
E	0.9	55	8.3	240	450	-	
F	3.0	45	8.6	230	440	-	
G	0.75	62	8.45	210	410	-	
G	3.0	35	8.3	220	370	-	
G	0.10	70	8.3	-	-	-	
G	0.18	56	8.1	-	-	-	
G	0.18	75	8.0	-	-	-	
G	1.40	90	8.0	-	-	-	
G	0.21	75	7.7	-	-	-	
G	0.70	29	7.3	-	-	-	
G	0.08	75	8.1	-	-	-	
H	0.50	67	7.9	-	-	-	
H	2.5	75	7.9	-	-	-	
H	2.7	68	7.9	-	-	-	
H	1.3	88	8.0	-	-	-	
H	1.4	90	8.1	-	-	-	
H	2.5	80	7.3	-	-	-	
H	0.7	80	8.0	-	-	-	
H	1.2	68	7.8	-	-	-	
H_2	0.4	35	8.5	142	250	-	
I	0.8	63	8.5	220	430	-	
I	1.5	35	8.4	170	290	-	
H	0.50	67	7.9	-	-	-	
H	1.8	72	8.5	230	440	-	
H	1.6	50	8.6	180	300	-	

Body of Water--Kickapoo Creek

Station Number	Date	Water Temp. C	Air Temp. C	D.O. ppm	Turbidity jtu	NO_3 ppm	NO_2 ppm
40	9/12/67	23	28	10*	109	30.8	0.75
41	9/12/67	20	21	10*	35	163*	6.2
42	9/13/67	19	24	10*	10	35	5.7
43	9/13/67	21.5	27	15*	5	24.2	0.594
45	9/14/67	20	28	8.5	15	35.2	0.627
46	9/18/67	21	26	7.5	10	35	0.6
47	9/18/67	21	24	7.0	27	15.4	0.4
47A	10/31/67	12	15	-	33	16	0.15
40	8/ 7/68	-	-	-	48	13.2	54.45
41	8/ 7/68	29.5	29	8.5*	28	4.4	0.264
42	8/ 7/68	29.5	27	8.5*	5	22	0.561
43	8/ 5/68	29.0	30	8.5*	15	22	2.3
45	8/ 5/68	28.5	31	8.1*	20	30.8	1.815
46	8/ 5/68	28	33	6.6	40	44	1.32
47	9/ 4/68	21	22	7.5	12	0	7.0
47A	9/ 4/68	23	20	7.5	12	8.0	6.0
40	3/20/69	10.0	9.5	10.5	0	26.4	6.19
40	8/29/69	-	-	-	70	44.0	3.17
40A	8/29/69	-	-	-	20	57.2*	1.65
41	8/29/69	-	-	-	30	57.2*	1.65
43	3/20/69	10.0	9.5	10.5	0	22.0	3.71
45	8/ 7/69	-	-	-	45	17.6	1.65
46	8/ 7/69	-	-	-	40	44.0	0.83
47	7/25/69	-	-	-	25	22.0	0.43
47A	7/25/69	-	-	-	35	44.0	0.33
"	8/ 7/69	-	-	-	15	39.6	2.80
Outfall from Mattoon treat. plant	8/5/70	23.0	-	5.0	200	57.2	0.55
40	8/ 5/70	24.2	-	3.2	12	-	0.19
40A	8/ 5/70	23.8	-	8.0	5	28.6	0.45
41	3/20/70	10.0	11.5	11.5	0	8.8	4.95
41	6/28/70	24.0	27.0	8.6*	10	29.0	2.89
41	8/ 5/70	22.2	-	6.2	4	35.0	-
42	8/29/79	-	-	-	20	8.8	0.83
42	6/28/70	-	22.0	8.5	10	19.3	1.70
42	8/ 5/70	22.9	-	7.5	12	33.0	0.12
43	6/28/70	25.0	28.0	8.5	2	23.7	0.46
43	8/ 5/70	22.5	-	6.7	5	24.2	0.11
45	6/28/70	25.0	30.0	7.5	10	17.7	0.50
45	8/ 5/79	22.5	-	6.8	12	22.0	0.12
46	3/18/70	3.0	-	13.5	-	-	0.27
46	3/23/70	6.0	-	11.1	-	4.1	0.34
46	3/30/70	5.5	-	-	-	8.5	0.33

* More than drinking water standard

Body of Water--Kickapoo Creek (con't)

STATION NUMBER	PO_4 ppm	SO_4 ppm	pH	Hardness Ca ppm	Hardness Total ppm	CO_2 ppm	BOD ppm
40	50	110	8.5	80	220	32	
41	3.3	105	6.4	100	220	44	
42	37.5	100	7.5	125	220	20	
43	33	90	7.6	90	230	20	
45	40	82	8.1	110	215	28	
46	20	80	8.0	105	230	20	
47	22	85	7.8	140	250	60	
47A	15.5	85	8.7	180	290	52	
40	22.5	130	7.4	190	290	-	
41	4.2	130	7.7	220	300	-	
42	3.8	100	7.8	240	320	-	
43	3.4	100	8.5	200	300	-	
45	3.2	100	8.4	190	320	-	
46	4.6	100	8.5	170	340	-	
47	6.2	-	8.4	240	420	-	
47A	8.2	-	8.3	240	420	-	
40	9.5	100.0	8.3	250	450	-	
40	27.5	125.0	7.3	-	-	-	
40A	27.5	95.0	8.2	-	-	-	
41	25.0	100.0	7.6	-	-	-	
43	7.0	95.0	8.7	250	470	-	
45	17.5	95.0	8.6	250	400	-	
46	17.5	90.0	8.5	250	410	-	
47	2.8	55	7.8	240	390	-	
47A	2.6	60	7.8	220	380	-	
H	3.8	65	8.4	260	450	-	
Outfall from Mattoon Treat. plant	28.5	-	7.4	85	346	-	28.0
40	23.0	-	7.1	121	221	-	15.6
40A	18.5	-	7.7	121	200	-	7.2
41	9.0	95.0	8.45	250	460	-	-
41	7.0	92.0	8.2	186	338	-	-
41	23.0	-	7.3	128	220	-	7.2
42	20.0	80.0	8.2	-	-	-	-
42	8.0	100.0	8.3	167	340	-	-
42	21.0	-	7.7	98	210	-	6.0
43	7.5	80.0	8.4	190	253	-	-
43	16.0	-	8.0	-	227	-	7.2
45	10.0	80.0	8.3	98	398	-	-
45	18.5	-	8.0	-	208	-	7.2
46	8.8	100	7.4	-	-	-	
46	4.6	100	8.0	-	-	-	-
46	2.8	110	7.9	-	-	-	-

Body of Water--Kickapoo Creek (cont)

Station Number	Date	Water Temp. C	Air Temp. C	D.O. ppm	Turbidity jtu	NO_3 ppm	NO_2 ppm
46	4/ 6/70	7.0	-	-	-	15.0	0.37
46	4/13/70	12.0	-	-	-	15.1	0.26
46	4/20/70	9.4	-	-	-	19.6	0.20
46	4/27/70	12.7	-	-	-	16.6	0.43
46	5/ 4/70	13.0	-	-	-	18.3	0.43
46	6/28/70	25.0	30.0	8.0	0	21.5	0.46
46	8/ 5/70	22.0	-	6.0	15	18.7	0.14
47	8/ 5/70	22.5	-	6.6	5	11.0	0.40
47A	8/ 5/70	22.0	-	5.2	10	13.2	0.50
H	3/18/70	2.0	-	11.0	-	-	0.26
H	3/23/70	5.5	-	11.2	-	17.3	0.35
H	3/30/70	5.5	-	-	-	12.9	0.26
H	4/ 6/70	10.0	-	-	-	16.3	0.25
H	4/13/70	12.0	-	-	-	12.7	0.46
H	5/ 4/70	13.0	-	-	-	2.72	0.28

Body of Water--Kickapoo Creek (con't)

Station Number	PO_4 ppm	SO_4 ppm	pH	Hardness Ca ppm	Hardness Total ppm	CO_2 ppm	BOD ppm
46	3.2	110	8.0	-	-	-	-
46	2.6	65	7.4	-	-	-	-
46	0.9	41	7.4	-	-	-	-
46	1.4	90	8.1	-	-	-	-
46	2.4	76	7.7	-	-	-	-
46	8.0	82	8.3	171	-	-	-
46	17.5	-	7.9	-	-	-	7.2
47	15.0	-	8.2	147	-	-	7.2
47A	11.5	-	7.9	140	-	-	5.6
H	3.4	90	8.1	-	-	-	-
H	2.7	75	7.7	-	-	-	-
H	1.75	92	8.0	-	-	-	-
H	1.8	90	8.0	-	-	-	-
H	2.8	80	7.3	-	-	-	-
H	1.2	59	7.8	-	-	-	-

Body of water--Polecat Creek

Station Number	Date	Water Temp. C	Air Temp. C	D.O. ppm	Turbidity jtu	NO_3 ppm	NO_2 ppm
11	8/21/67	20	21	13*	20	39.6	0.099
6	8/16/67	29	31	19*	5	22	0.033
7	8/16/67	24	28	16*	5	17.6	0.033
7	9/ 7/67	19	17	14*	13	23.3	0.04
5	8/15/67	28	27.5	20*	15	13.2	0.033
10D	9/ 9/68	22	18.5	9.5*	170	0.4	0.3
10C	9/ 9/68	20	21	8.0	35	2.6	0.4
10B	9/ 4/68	19	20	8.0	15	6.6	0.375
10	9/ 5/68	22	24	8.3	25	0	0.066
11A	9/ 5/68	20	22	8.0	30	26.4	0.066
11	9/ 5/68	21.5	21.5	8.0	20	0	0.149
5	9/ 7/68	16	20	9.3	20	4.4	0.033
6	8/29/69	-	-	-	35	0	0
7	4/ 8/69	14.0	-	-	0	44.0	2.06
7	8/29/69	-	-	-	35	26.4	0
10	4/ 8/69	20.0	-	-	0	39.6	1.65
10	7/31/69	-	29.4	-	40	52.8*	0.23
10A	7/31/69	-	29.4	-	30	17.6	0.19
10B	7/10/69	-	-	-	15	48.4*	0.33
10C	8/ 5/69	-	-	-	30	26.4	0.36
10D	7/30/69	-	-	-	15	30.8	0.43
11	4/ 8/69	19.0	-	-	0	44.0	2.06
11	8/28/69	-	-	-	40	8.8	0
11A	7/31/69	-	29.4	-	30	17.6	0.20

Body of Water--Polecat Creek (con't)

Station Number	PO_4 ppm	SO_4 ppm	pH	Hardness Ca ppm	Hardness Total ppm	CO_2 ppm	BOD ppm
11	8.0	150	8.3	180	300	100	
6	8.0	100	8.6	100	220	120	
7	1.1	100	8.6	120	250	88	
7	0.4	33	8.4	115	250	16	
5	1.2	55	8.4	110	260	76	
10D	0.5	-	8.1	260	450	-	
10C	0.4	-	8.4	270	460	-	
10B	0.3	28	8.5	250	470	-	
10	0.6	45	8.5	150	440	-	
11A	0.5	66	8.4	220	450	-	
11	0.2	35	8.5	180	450	-	
5	0.2	33	8.5	260	450	-	
6	0.7	50	8.5	-	-	-	
7	1.6	65	8.5	210	400	-	
7	0.4	45	8.5	-	-	-	
10	1.2	60	8.3	250	450	-	
10	0.4	70	8.4	240	460	-	
10A	0.6	70	8.4	200	470	-	
10B	0.5	60	8.4	260	440	-	
10C	0.5	65	8.4	260	450	-	
10D	0.3	55	8.3	270	470	-	
11	1.4	60	8.4	250	460	-	
11	0.5	10	8.5	-	-	-	
11A	0.5	65	8.4	180	470	-	

Body of Water--Riley Creek

Station Number	Date	Water Temp. C	Air Temp. C	D.O. ppm	Turbidity jtu	NO_3 ppm	NO_2 ppm
28	8/24/67	19	27	13*	30	22.0	0.165
29	8/24/67	19	22	14*	30	26.4	0.033
28	8/ 8/68	27	29	7.7	15	26.4	0.429
29	8/ 8/68	29	29	7.1	25	4.4	0.594
28	3/11/69	1.0	1.0	13.5	10	140.0*	4.14
28	3/20/69	9.0	9.5	10.5	0	44.0	4.95
28	4/10/70	-	-	-	-	33.0	0.13
28	6/28/70	22.0	28.0	10.0*	10	26.3	0.14
28A	4/10/70	-	-	-	-	32.9	0.13
29	6/28/70	21.5	21.0	10.0*	12	22.3	0.26

Station Number	PO_4 ppm	SO_4 ppm	pH	Hardness Ca ppm	Hardness Total ppm	CO_2 ppm	BOD ppm
28	1.25	88	8.3	170	270	28	
29	8.0	125	8.2	150	250	56	
28	0.8	60	6.6	220	340	-	
29	1.0	72	8.5	210	350	-	
28	0.9	48	8.7	250	430	-	
28	0.9	45	8.7	250	450	-	
28	0.3	80	8.2	-	-	-	
28	0.3	65	8.3	80	368	-	
28A	0.2	80	8.3	-	-	-	
29	0.4	65	8.1	157	352	-	

Body of Water--Whetstone Creek

Station Number	Date	Water Temp. C	Air Temp. C	D.O. ppm	Turbidity jtu	NO_3 ppm	NO_2 ppm
1	8/ 9/67	30	28	15*	35	26.4	0.099
3	1/22/68	2	7	-	110	88*	0.016
3	4/ 2/68	10	12	15*	20	-	0.083
1	4/ 2/68	10	12	14*	17	-	0.069
1	4/ 8/69	12.0	-	-	0	44.0	1.65
1	8/15/69	-	-	-	0	0	0
3	4/ 8/69	13.0	-	-	0	17.6	1.65
3	8/15/69	-	-	-	0	12.5	0.30

Station Number	PO_4 ppm	SO_4 ppm	pH	Hardness Ca ppm	Hardness Total ppm	CO_2 ppm	BOD ppm
1	6.5	28	8.5	150	260	28	
3	1.2	70	7.8	100	160	-	
3	0.25	89	8.25	250	300	48	
1	0.22	90	8.25	250	300	-	
1	1.2	80	8.6	250	450	-	
1	0.9	40	8.5	-	-	-	
3	1.4	100	8.6	230	430	-	
3	0.8	40	8.5	-	-	-	

Body of Water--Indian Creek

Station Number	Date	Water Temp. C	Air Temp. C	D.O. ppm	Turbidity jtu	NO_3 ppm	NO_2 ppm
9	8/18/67	21	25	15*	0	15.6	2.97
9A	6/24/68	22	22.5	8	80	-	-
9B	7/ 1/68	28.5	30	7.5	65	-	-
9	7/ 1/67	29	34	8.5*	60	-	-
9	3/17/69	12.0	18.0	11.0	10	4.4	0.16
9	7/ 1/69	14.5	15.0	9.5	5	22.0	0.03
9A	3/17/69	10.0	18.0	13.0*	10	4.4	0.26
9A	7/ 1/69	13.5	14.5	9.0	5	0	0
9B	7/ 1/69	14.5	14.5	11.0	-	22.0	0.17

Station Number	PO_4 ppm	SO_4 ppm	pH	Hardness Ca ppm	Hardness Total ppm	CO_2 ppm	BOD ppm
9	4.60	80	8.6	180	340	200	
9A	0.75	62	8.4	150	310	-	
9B	0.20	80	8.3	250	310	-	
9	0.15	60	8.4	190	270	-	
9	0.4	60	8.2	180	410	-	
9	0.2	55	8.6	220	430	-	
9A	0.6	50	8.3	170	400	-	
9A	-	60	8.7	210	430	-	
9B	-	60	8.7	220	440	-	

Body of Water--Union Drainage Dist #3

Station Number	Date	Water Temp. C	Air Temp. C	D.O. ppm	Turbidity jtu	NO_3 ppm	NO_2 ppm
30	8/25/67	20	22	12*	50	13.3	.099
33	8/25/67	20	24	12*	30	1.0	.132
32	8/25/67	20	26	14*	25	2.0	.066
33	7/24/68	26	26	7.5	65	24.2	1.32
32	7/18/68	25	27	6.5	27	4.4	3.96
30	7/18/69	-	-	-	15	26.4	0.23
30	3/18/70	5.0	-	16.5*	-	-	0.12
30	3/23/70	5.0	-	12.6	-	21.9	0.11
30	3/30/70	5.5	-	-	-	4.3	0.07
30	4/ 6/70	8.5	-	-	-	45.0*	0.06
30	4/13/70	[illegible].0	-	-	-	36.2	0.11
30	4/20/70	9.4	-	-	-	37.3	0.12
30	4/27/70	11.6	-	-	-	32.9	0.10
30	5/ 4/70	12.0	-	-	-	41.8	0.05
32	7/18/70	-	-	-	15	26.4	0.23
32	3/18/70	2.5	-	22.5*	-	-	0.09
32	3/23/70	6.0	-	10.2	-	8.6	0.15
32	3/30/70	5.0	-	-	-	8.7	0.10
32	4/ 6/70	7.0	-	-	-	37.3	0.06
32	4/13/70	11.0	-	-	-	31.8	0.13
32	4/20/70	10.0	-	-	-	27.4	0.14
32	4/27/70	12.0	-	-	-	32.9	0.09
32	5/ 4/70	12.0	-	-	-	36.2	0.12

Body of Water--Union Drainage Dist. #3

Station Number	PO_4 ppm	SO_4 ppm	pH	Hardness Ca ppm	Hardness Total ppm	CO_2 ppm	BOD ppm
30	2.8	100	8.6	170	300	28	
33	0.8	200	8.3	250	300	-	
32	0.8	100	7.6	220	320	-	
33	0.5	55	8.15	210	330	-	
32	1.75	65	8.3	230	340	-	
30	0.8	55	8.7	-	-	-	
30	1.1	70	6.9	-	-	-	
30	0.2	60	8.0	-	-	-	
30	0.07	65	8.2	-	-	-	
30	0.25	70	8.0	-	-	-	
30	0.1	70	7.8	-	-	-	
30	1.1	35	7.4	-	-	-	
30	0.2	54	7.6	-	-	-	
30	0.2	60	7.8	-	-	-	
32	0.8	55	8.7	-	-	-	
32	0.1	68	8.1	-	-	-	
32	0.4	65	8.1	-	-	-	
32	0.2	70	8.1	-	-	-	
32	0.3	70	8.1	-	-	-	
32	0.6	70	7.1	-	-	-	
32	1.1	12	7.3	-	-	-	
32	0.2	68	7.8	-	-	-	
32	0.2	70	7.9	-	-	-	

Body of Water--Little Embarrass River

Station Number	Date	Water Temp. C	Air Temp. C	D.O. ppm	Turbidity jtu	NO_3 ppm	NO_2 ppm
17	8/21/67	20	24	16*	10	22	.066
16	8/21/67	19	26	12*	10	13.2	.099
13	8/21/67	19	24	14*	15	17.6	0.066
19	8/22/67	18	22	14*	20	17.6	0.099
13	7/ 2/68	22	29	8	8	2.2	0.132
19	7/ 2/68	21	21	8.5	15	4.4	0.154
17	7/15/68	26	28	7	10	8.8	7.92
16	7/15/68	25	28	6	20	82.2*	7.48
13	9/3/ 68	21	29	8	5	2.2	0.03
19	9/ 3/68	19	27.5	7	5	1.5	0.04
17	10/15/68	18	25	5	30	2.4	0.15
13	3/ 7/69	4.0	7.0	12.0	10	19.8	2.53
13	8/ 6/69	-	-	-	20	26.4	0.03
13A	8/ 6/69	-	-	-	20	4.4	0.07
16	3/ 7/69	4.0	7.0	12.5	0	17.6	2.89
16	8/ 6/69	-	-	-	40	17.6	0
17	8/28/69	-	-	-	35	0	0
19	3/ 7/69	4.0	7.0	10.5	0	44.0	0.50
19	8/ 6/69	-	-	-	30	39.6	0.03

Body of Water--Little Embarrass River (cont)

Station Number	PO_4 ppm	SO_4 ppm	pH	Hardness Ca ppm	Hardness Total ppm	CO_2 ppm	BOD ppm
17	0.8	90	8.6	200	260	88	
16	0.7	90	8.5	180	260	76	
13	0.8	100	8.6	200	280	-	
19	0.3	60	7.8	-	-	-	
13	1.4	55	8.1	130	290	-	
19	2.2	58	8.2	170	270	-	
17	0.4	45	8.0	210	320	-	
16	0.4	48	8.3	210	330	-	
13	0.35	55	8.3	240	470	-	
19	0.40	45	8.4	220	450	-	
17	0.30	-	8.5	220	360	-	
13	0.5	65	8.3	270	490	-	
13	0.4	45	8.6	240	430	-	
13A	0.7	50	8.5	250	440	-	
16	0.1	52	8.2	240	450	-	
16	0.6	50	8.5	250	440	-	
17	1.0	35	8.5	-	-	-	
19	0.15	42	8.7	280	500	-	
19	0.9	45	8.4	260	460	-	

Body of Water--Cassell Creek

Station Number	Date	Water Temp. C	Air Temp. C	D.O. ppm	Turbidity jtu	NO_3 ppm	NO_2 ppm
25	8/23/67	20	24	14*	10	0	.264
26	8/23/67	22	25	15*	20	4.4	.33
27	8/23/67	22	26	14*	20	0	.033
31	8/25/67	20	26	11*	20	13.3	1.98
35	8/31/67	15	16	12*	15	26.4	0.25
34	7/18/68	22	27	5	40	7.7	6.6
31	7/18/68	24	27	7.5	20	2.2	2.86
27A	7/24/68	28	24	8.2	20	4.4	2.75
27	7/30/68	25	26.5	7.5	10	88.0	0.264
26	7/30/68	22.5	25	9.2*	20	39.6	0.44
25	8/25/68	19.2	19.2	-	23	4.4	0.033
25A-1	8/25/68	19	20	-	78	4.4	0.264
31	9/10/68	17	17	8.0	85	8.8	0.116
35	9/10/68	17	16.5	10.0*	60	44.0	0.049
34A	9/11/68	17	17	6.0	25	13.2	0.066
34A	9/11/68	18	19	9.0	38	12.0	0.05
34	9/11/68	17	17	6.5	75	0.0	0.033
35	9/11/68	17.5	21	5.5	35	74.8*	0.099
31	9/11/68	19	17	10.0*	35	0.0	0.099
25A-1	8/26/69	-	-	-	50	0	0
25B	8/26/69	-	-	-	20	0	0
26	8/ 1/69	-	-	-	100	13.6	0.01
27	8/ 1/69	-	-	-	65	27.2	0.26
27A	8/ 1/69	-	-	-	65	13.6	0.17
31	7/18/69	-	-	-	11	8.8	0.29
31	3/18/70	2.5	-	19.0*	-	-	0.11
31	3/23/70	6.0	-	11.4	-	8.49	0.31
31	3/30/70	5.0	-	-	-	17.4	0.17
31	4/ 6/70	7.0	-	-	-	22.1	0.07
31	4/13/70	10.5	-	-	-	16.2	0.33
31	4/20/70	10.0	-	-	-	19.6	0.16
31	4/27/70	12.7	-	-	-	21 9	0.13
31	5/ 4/70	11.5	-	-	-	19.6	0.17
34	7/18/70	-	-	-	13	10.0	0.70
34	3/18/70	4.0	-	17.0*	-	-	0.32
34	3/23/70	6.0	-	12.3	-	7.5	0.18
34	3/30/70	5.5	-	-	-	17.4	0.17
34	4/ 6/70	7.0	-	-	-	22.8	0.25
34	4/13/70	10.5	-	-	-	24.5	0.43
34	4/20/70	10.0	-	-	-	19.7	0.13
34	4/27/70	12.7	-	-	-	17.4	0.18
34	5/ 4/70	11.5	-	-	-	18.5	0.2

Body of Water--Cassell Creek (con't)

Station Number	Date	Water Temp. C	Air Temp. C	D.O. ppm	Turbidity jtu	NO_3 ppm	NO_2 ppm
34A	3/18/70	3.0	-	15.5*	-	-	0.07
34A	3/23/70	5.0	-	12.±	-	13.1	0.07
34A	3/30/70	4.0	-	-	-	7.9	0.07
34A	4/ 6/70	6.5	-	-	-	28.6	0.03
34A	4/13/70	10.5	-	-	-	25.2	0.08
34A	4/20/70	8.9	-	-	-	27.3	0.11
34A	4/27/70	12.7	-	-	-	23.0	0.09
34A	5/ 4/70	11.0	-	-	-	20.8	0.07

Body of Water--Cassell Creek (cont)

Station Number	PO_4 ppm	SO_4 ppm	pH	Hardness Ca ppm	Hardness Total ppm	CO_2 ppm	BOD ppm
25	1.5	150	7.6	180	310	-	
26	0.6	150	8.1	180	340	-	
27	0.8	70	8.2	180	300	-	
31	34.0	125	8.4	150	310	60	
35	25.0	75	8.2	160	330	60	
34	1.2	50	8.3	230	350	-	
31	5.5	70	8.2	240	350	-	
27A	0.3	45	8.35	230	340	-	
27	0.25	50	8.4	220	320	-	
26	0.4	57	8.3	230	340	-	
25	0.9	68	8.65	280	830	-	
25A-1	0.8	62	8.4	370	800	-	
31	21.0	125	7.9	252	450	-	
35	527.5	125	8.1	253	453	-	
34A	2.0	28	8.3	250	470	40	
34A	9.0	-	8.4	270	460	120	
34	30.5	110	8.0	270	470	116	
35	19.0	95	8.2	270	480	64	
31	18.0	78	8.3	280	500	92	
25A-1	0.6	55	8.7	-	-	-	
25B	0.3	40	8.8	-	-	-	
26	0.7	65	8.1	220	360	-	
27	0.6	45	8.4	230	380	-	
27A	0.9	45	8.4	230	380	-	
31	1.0	65	8.5	270	480	-	
31	0.23	62.0	7.7	-	-	-	
31	2.60	75	7.9	-	-	-	
31	1.1	87	8.0	-	-	-	
31	0.3	80	8.0	-	-	-	
31	2.0	55	7.4	-	-	-	
31	1.1	33	7.3	-	-	-	
31	0.6	65	7.9	-	-	-	
31	0.9	56	7.8	-	-	-	
34	8.0	90	8.6	320	520	-	
34	2.7	71	7.9	-	-	-	
34	0.5	65	8.1	-	-	-	
34	1.1	87	8.0	-	-	-	
34	1.9	80	7.7	-	-	-	
34	3.2	65	7.0	-	-	-	
34	1.1	38	7.3	-	-	-	
34	1.0	68	7.8	-	-	-	
34	1.1	59	7.7	-	-	-	

Body of Water--Cassell Creek (con't)

Station Number	PO_4 ppm	So_4 ppm	pH	Hardness Ca ppm	Hardness Total ppm	Co_2 ppm	BOD ppm
34A	0.07	70	7.4	-	-	-	
34A	0.07	65	8.0	-	-	-	
34A	0.07	60	8.1	-	-	-	
34A	0.03	65	8.1	-	-	-	
34A	0.08	55	8.0	-	-	-	
34A	0.11	35	7.4	-	-	-	
34A	0.09	60	7.9	-	-	-	
34A	0.07	47	7.7	-	-	-	

Body of Water--Greasy Creek

Station Number	Date	Water Temp. C	Air Temp. C	D.O. ppm	Turbidity jtu	NO_3 ppm	NO_2 ppm
20	8/22/67	22	27	13.0*	20	4.4	0.099
22	8/22/67	22	28	14.0*	15	4.4	0.066
21	8/22/67	22	26	13.0*	20	8.8	0.231
20	8/31/68	17	22	9.0	0	4.4	0.33
22	8/30/68	20	27	7.5	3	4.4	0.085
21	8/30/68	17	22	7.5	0	4.4	0.033
20	3/ 7/69	4.0	5.0	11.5	0	52.8*	0.50
20	8/22/69	-	-	-	15	0	0
20	6/21/70	18.0	20.0	8.0	12	21.8	0.18
20A	6/12/70	27.3	34.0	7.7	10	17.2	0.36
20B	8/22/70	-	-	-	45	22.0	0.23
20B	6/12/70	27.2	33.0	11.2*	10	19.4	0.39
20C	6/12/70	26.0	31.0	11.0*	16	17.0	0.60
20D	8/22/69	-	-	-	15	10.0	0.56
20D	6/29/70	18.0	20.0	9.4	0	12.9	0.26
21	3/ 7/69	4.0	5.0	12.0	2	74.8*	5.36
21	6/29/70	18.0	20.0	8.0	10	17.4	0.46
22	3/7/69	4.0	5.0	12.5	0	22.0	3.71
22	6/21/70	18.0	20.0	8.7	5	17.4	0.16

Body of Water--Greasy Creek (cont)

Station Number	PO_4 ppm	So_4 ppm	pH	Hardness Ca ppm	Hardness Total ppm	CO_2 ppm	BOD ppm
20	2.0	40	8.0	160	300	-	
22	3.0	40	8.0	160	320	-	
21	2.0	35	7.9	180	300	-	
20	0.7	12	8.3	220	410	-	
22	0.3	15	8.45	200	430	-	
21	0.65	23	8.45	180	450	-	
20	0.15	45.0	8.7	260	460	-	
20	0.5	20.0	8.5	-	-	-	
20	0.05	50	7.8	44	281	-	
20A	0.05	51	7.7	145	309	-	
20B	0.7	25	8.3	-	-	-	
20B	0.05	47	8.0	160	318	-	
20C	0.05	41	8.3	132	297	-	
20D	0.5	20	-	-	-	-	
20D	0.10	48	6.9	54	260	-	
21	0.18	45	8.8	270	490	-	
21	0.05	50	7.8	65	276	-	
22	0.1	45	8.3	240	460	-	
22	0.05	52	8.1	120	286	-	

Body of Water--Hog Creek

Station Number	Date	Water Temp. C	Air Temp. C	D.O. ppm	Turbidity jtu	NO_3 ppm	NO_2 ppm
23	8/22/67	19	21	13*	20	22	0.033
23	8/29/68	21	27	7.7	32	0.5	0.04
23	3/ 7/69	4.0	8.0	11.5	20	8.8	0.25
23	8/28/69	-	-	-	35	4.4	0.07
23	6/21/70	18.0	20.0	8.5	10	6.4	0.42

Station Number	PO_4 ppm	SO_4 ppm	pH	Hardness Ca ppm	Hardness Total ppm	CO_2 ppm	BOD ppm
23	8.0	15.0	7.7	190	300	-	
23	0.7	15.0	8.3	260	440	-	
23	0.1	50	8.3	250	490	-	
23	0.9	10	8.4	-	-	-	
23	0.2	48	8.2	8.6	282	-	

Body of Water--Hurricane Creek (West Branch)

Station Number	Date	Water Temp. C	Air Temp. C	D.O. ppm	Turbidity jtu	NO_3 ppm	NO_2 ppm
48	9/19/67	29	21	5	25	6.0	0.012
48	7/ 8/68	25	31	8.5*	30	0.88	0.052
48	8/ 8/68	11	16	5	15	-	-
48	3/ 5/69	4.0	3.0	10.5	33	61.6*	1.07
48	8/15/69	-	-	-	0	0	0

Station Number	PO_4 ppm	SO_4 ppm	pH	Hardness Ca ppm	Hardness Total ppm	CO_2 ppm	BOD ppm
48	1.2	38	8.1	165	290	-	
48	0.2	55	8.45	150	280	-	
48	-	-	7.5	-	-	-	
48	0.4	85	7.8	250	460	-	
48	0.4	30	7.5	-	-	-	

Body of Water--Hurricane Creek (East Branch)

Station Number	Date	Water Temp. C	Air Temp. C	D.O. ppm	Turbidity jtu	NO_3 ppm	NO_2 ppm
57	9/25/67	14	22	6.5	5	7	0.015
58	9/25/67	14	21	6.0	15	38	0.015
57	7/11/68	25	27	7.6	61	4.4	0.354
58	7/8/68	31	33	8.5*	10	4.4	0.198
57	8/15/69	-	-	-	0	8.8	0.03
58	3/ 5/69	4.0	3.0	12.6	10	22.0	0.78
58	8/15/69	-	-	-	0	4.4	0.03

Station Number	PO_4 ppm	SO_4 ppm	pH	Hardness Ca ppm	Hardness Total ppm	CO_2 ppm	BOD ppm
57	0.5	49	8.1	190	310	32	
58	0.3	45	8.1	160	290	44	
57	0.78	61	8.1	170	260	-	
58	0.30	55	8.5	170	290	-	
57	0.4	45	8.4	-	-	-	
58	0.3	70	8.4	240	430	-	
58	0.3	55	8.4	-	-	-	

Body of water--Opossum Creek

Station Number	Date	Water Temp. C	Air Temp. C	D.O. ppm	Turbidity jtu	NO_3 ppm	NO_2 ppm
51	5/13/68	16	30	-	15	22	.21
51A	5/13/68	21	30	-	15	22	0.12
51A	3/ 5/69	7.0	4.0	11.0	5	8.8	1.29
51	8/15/69	-	-	-	0	17.6	0.40

Station Number	PO_4 ppm	SO_4 ppm	pH	Hardness Ca ppm	Hardness Total ppm	CO_2 ppm	BOD ppm
51	-	52	7.8	210	320	-	
51A	-	65	8.2	210	320	-	
51A	0.3	60	8.4	170	450	-	
51	0.8	30	8.4	-	-	-	

Body of Water--Kaskaskia River

Station Number	Date	Water Temp. C	Air Temp. C	D.O. ppm	Turbidity jtu	NO_3 ppm	NO_2 ppm
2	8/14/67	22	27.5	14*	40	39.6	0.165
2B	8/28/68	20	25	7	45	2.2	0.066
2	8/26/68	25	25	6.5	20	4.4	0.134
2C	8/26/68	25	25	6.5	22	2.2	0.165
2D	8/26/68	24	25	7.2	41	4.4	0.099
2	3/ 6/69	4.0	8.0	12.0	10	39.6	4.1
2C	8/25/69	-	-	-	55	4.4	0
2D	3/ 6/69	5.0	10.0	12.0	5	44.0	2.89
2D	8/25/69	-	-	-	60	4.4	0

Station Number	PO_4 ppm	SO_4 ppm	pH	Hardness Ca ppm	Hardness Total ppm	CO_2 ppm	BOD ppm
2	0.6	100	8.2	290	440	56	
2B	0.08	35	8.25	200	450	-	
2	0.6	150	8.6	720	750	-	
2C	0.6	300	8.6	850	950	-	
2D	0.98	240	8.7	750	850	-	
2	1.2	90	8.7	320	510	-	
2C	1.8	300	8.4	-	-	-	
2D	0.8	90	8.8	330	500	-	
2D	1.5	350	-	-	-	-	

Body of Water--Flat Branch Creek

Station Number	Date	Water Temp. C	Air Temp. C	D.O. ppm	Turbidity jtu	NO_3 ppm	NO_2 ppm
69	1/ 4/67	24	20	-	45	-	-
70	10/4/67	22	30	-	50	28	-
71	10/4/67	18	26	5.5	44	35.2	0.01
71	8/28/68	17.5	23.5	6.5	35	0.44	0.033
66	8/21/69	-	-	-	25	0	0
69	3/ 6/69	5.0	7.0	12.5	27	88.0*	11.55
69	8/21/69	-	-	-	20	0	0
69A	8/21/69	-	-	-	20	-	0
70	3/ 6/69	4.0	7.0	12.5	2	66.0*	7.84
70	8/21/69	-	-	-	55	4.4	0.10
70B	8/21/69	-	-	-	140	30.4	0
71	3/ 6/69	4.0	8.0	12.0	3	79.2*	7.84
71	8/21/69	-	-	-	50	4.4	0.03

Station Number	PO_4 ppm	SO_4 ppm	pH	Hardness Ca ppm	Hardness Total ppm	CO_2 ppm	BOD ppm
69	1.2	-	8.75	90	250	20	
70	2.6	29	8.1	150	260	60	
71	3.8	30	8.1	150	280	240	
71	0.8	25	8.4	300	500	-	
66	0.2	25	8.3	-	-	-	
69	0.3	48	8.6	230	480	-	
69	0.7	15	8.5	-	-	-	
69A	0.3	15	8.6	-	-	-	
70	0.3	46	8.5	220	470	-	
70	1.8	20	8.4	-	-	-	
70B	30.0	70	8.5	-	-	-	
71	0.2	48	8.4	230	460	-	
71	1.8	25	8.5	-	-	-	

Body of Water--Crabapple Creek

Station Number	Date	Water Temp. C	Air Temp. C	D.O. ppm	Turbidity jtu	NO_3 ppm	NO_2 ppm
68A	8/ 8/68	26	32	-	30	4.4	0.264
68B	8/ 8/68	27	32	-	35	4.4	0.264
68A	9/26/68	14.5	20	6.5	18	-	-
68B	9/26/68	14.5	20	6.5	38	-	-
68B	3/ 6/69	5.0	11.0	13.0*	10	52.8*	2.89
68A	8/25/69	-	-	-	50	17.6	0.17
68B	8/25/69	-	-	-	55	17.6	0.07

Station Number	PO_4 ppm	SO_4 ppm	pH	Hardness Ca ppm	Hardness Total ppm	CO_2 ppm	BOD ppm
68A	3.0	33	7.2	230	350	-	
68B	1.5	33	7.1	210	330	-	
68A	-	-	8.2	-	-	-	
68B	-	-	8.5	-	-	-	
68B	0.2	45	8.8	270	470	-	
68A	0.6	30	7.7	-	-	-	
68B	0.7	30	8.2	-	-	-	

Body of Water--Whitley Creek

Station Number	Date	Water Temp. C	Air Temp. C	D.O. oom	Turbidity jtu	NO_3 ppm	NO_2 ppm
62A	3/ 6/69	6.0	11.0	17.0*	0	44.0	4.95
62A	8/19/69	-	-	-	5	0	0
62B	8/19/69	-	-	-	5	0	0.13
62	6/28/70	23.0	26.0	8.8*	10	18.2	1.58
62A	6/28/70	27.0	29.0	9.2*	5	21.9	0.12

Station Number	PO_4 ppm	SO_4 ppm	pH	Hardness Ca ppm	Hardness Total ppm	CO_2 ppm	BOD ppm
62A	0.9	35	8.7	300	580	-	
62A	1.5	-	8.4	-	-	-	
62B	1.0	-	8.3	-	-	-	
62	0.15	50	8.2	5.9	277	-	
62A	0.15	52	8.2	8.1	298	-	

Body of Water--Little Wabash

Station Number	Date	Water Temp. C	Air Temp. C	D.O. ppm	Turbidity jtu	NO_3 ppm	NO_2 ppm
64	10/ 2/67	16	28	7	12	53*	0.16
64	8/27/68	16	17	7.5	15	1.32	0.73
64A	8/27/68	19	20	9	30	8.8	0.033
64B	8/28/68	19.5	23	8.5	30	4.4	0.066
64A	3/ 6/69	7.0	11.0	10.2	20	44.0	1.65
64A	8/19/69	-	-	-	25	0	0.06
64	8/19/69	-	-	-	25	0	0.33
60A	7/18/70	25.0	28.0	8.2	10	12.8	1.65
64A	7/18/70	25.0	27.0	4.2	60	0	0

Station Number	PO_4 ppm	SO_4 ppm	pH	Hardness Ca ppm	Hardness Total ppm	CO_2 ppm	BOD ppm
64	9.2	30	8.1	170	360	60	
64	0.4	35	8.2	100	380	-	
64A	0.4	20	8.3	80	350	-	
64B	0.6	31	8.4	300	450	-	
64A	1.2	28	8.5	230	370	-	
64A	0.5	-	7.8	-	-	-	
64	0.9	-	8.2	-	-	-	
60A	3.0	62	7.7	340	410	-	
64A	0.1	12	7.8	330	400	-	

Body of Water--Clear Creek

Station Number	Date	Water Temp. C	Air Temp. C	D.O. ppm	Turbidity jtu	NO_3 ppm	NO_2 ppm
65	10/2/67	18	29	6	22	7	0.8
65	8/27/68	18	19	8.5	10	4.4	0.726
65	3/ 6/69	7.0	11.0	10.0	20	26.4	3.3

Station Number	PO_4 ppm	SO_4 ppm	pH	Hardness Ca ppm	Hardness Total ppm	CO_2 ppm	BOD ppm
65	1.2	90	8.5	130	420	68	
65	0.6	4.9	7.5	100	430	-	
65	1.0	52	8.7	250	470	-	

APPENDIX E. - The Number of Plankters per liter by Stream and Station, Where Collected, and Date

Plankton Population - Embarrass River

Station	Date	Population (Plankters per liter)
G	9/11/67	7,742
A	9/ 4/68	9,334
C	9/ 6/68	8,667
G	9/16/68	10,334
H	9/16/68	7,667
A	3/17/69	8,667
C	3/17/69	14,667
G	3/17/69	11,334
G	3/23/69	7,667
H	3/17/69	28,000
H	3/18/69	12/667
I	3/17/69	23,334
	2X	150,080
	$\bar{X}$	12,507
	N	12

Plankton Population - Kickapoo Creek

Station	Date	Population (Plankters per liter)
40	9/12/67	1,333
41	9/12/67	4,667
45	9/14/67	8,334
46	9/18/67	7,667
47	9/18/67	12,334
40	8/ 7/68	6,667
41	8/ 7/68	5,334
42	8/ 7/68	7,334
47	9/ 4/68	10,834
40	9/29/69	9,334
40A	8/ 5/70	9,667
41	6/28/70	14,334
42	8/ 5/70	11,334
43	3/20/70	8,334
43	8/ 5/70	8,334
45	6/28/70	13,667
46	3/18/70	7,667

Plankton Population

Station	Date	Population (Plankters per liter)
46	6/28/70	11,334
47	8/ 5/70	9,334
H	3/23/70	10,000
H	4/13/70	11,334

$2X = 189,177$

$\bar{X} = 9,008$

$N = 21$

Plankton Population - Polecat Creek

Station	Date	Population (Plankters per liter)
6	8/16/67	9,667
5	8/15/67	11,334
10D	9/ 9/68	10,000
10B	9/ 9/68	9,667
10	9/ 5/68	9,334
11	9/ 5/68	10,334
11A	9/ 5/68	10,334
5	9/ 7/68	12,334
7	4/ 8/69	9,334
10	4/ 8/69	11,000
10A	7/31/69	11,667
10C	8/ 5/69	11,000
11	4/ 8/69	10,334
11A	7/31/69	9,667

$2X = 146,006$

$\bar{X} = 10,429$

$N = 14$

Plankton Population - Riley Creek

Station	Date	Population (Plankters per liter)
28	8/24/67	6,667
29	8/24/67	8,334
28	8/ 8/68	8,000
29	8/ 8/68	10,000
28	3/11/69	3,667
28	3/20/69	3,667
28	6/28/70	12,334
29	6/28/70	9,667

$2X = 62,336$

$\bar{X} = 7,792$

$N = 8.$

Plankton Population- Whetstone Creek

Station	Date	Population (Plankters per liter)
1	8/ 9/67	10,000
3	1/22/68	11,334
3	4/ 2/68	9,667
1	4/ 2/68	9,667
3	4/ 8/69	11,334
1	3/15/69	12,332
3	4/ 8/69	10,000
3	8/15/69	9,667

$2X = 84,003$

$\bar{X} = 10,500$

$N = 8$

Plankton Population - Union Drainage

Section	Date	Population (Plankters per liter)
30	8/25/67	6,667
33	8/25/67	8,667
32	8/25/67	15,766
33	7/24/68	11,334
32	7/18/68	12,667
30	3/18/70	10,000
30	3/23/70	14,334
30	3/30/70	12,667
30	4/ 6/70	13,667
30	4/20/70	9,667
30	4/27/70	8,667
32	5/ 4/70	10,000
32	7/18/69	14,000
32	3/18/70	12,667
32	3/23/70	8,667
32	3/30/70	6,667
32	4/ 6/70	8,334
32	4/13/70	10,000
32	4/20/70	8,667
32	4/27/70	9,334
32	5/ 4/70	10,000

$2X = 222,439$

$\overline{X} = 10,592$

$N = 21$

Plankton Population - Little Embarrass

Station	Date	Population (Plankters per liter)
17	8/21/67	10,000
16	8/21/67	9,334
13	8/21/67	7,336
19	8/22/67	11,334
13	7/ 2/68	15,334
19	7/ 2/68	10,000
17	7/15/68	9,667
16	7/15/68	6,667
13	9/ 3/68	8,667
19	9/ 3/68	10,000
17	10/15/68	7,334
13	3/ 7/69	6,667
13	8/ 6/69	10,000
13A	8/ 6/69	8,667
16	3/ 7/69	12,334
16	8/ 6/69	11,667
17	8/28/69	14,334
19	3/ 7/69	9,667
19	8/ 6/69	6,667

$\Sigma x = 185,676$
$\bar{X} = 9,772$
$N = 19$

Plankton Population - Cassell Creek

Station	Date	Population (Plankters per liter)
25	8/23/67	4,667
26	8/23/67	6,334
27	8/23/67	4,667
31	8/25/67	5,334
35	8/31/67	4,667
31	7/18/68	6,667
34	7/18/68	5,334
26	7/30/68	7,334
27	7/30/68	6,334
31	9/10/68	7,775
35	9/10/68	7,334
31	3/18/70	7,667
34	3/18/70	5,334
31	5/ 4/70	7,334
34	4/20/70	5,334
34	5/ 4/70	7,775

Plankton Population - Cassell Creek (cont)

Station	Date	Population (Plankters per liter)
34A	3/23/70	6,667
34A	4/20/70	6,334

$\underline{2}X$ = 112,892
$\bar{X}$ = 6,272
N = 18

Plankton Population - Greasy Creek

Station	Date	Population (Plankters per liter)
20	8/22/67	2,334
21	8/22/67	5,667
22	8/22/67	4,334
20	8/31/68	6,334
21	8/20/68	1,667
22	8/30/68	3,334
20	3/ 7/69	5,667
20	6/21/70	4,334
20A	6/12/70	2,334
20B	6/12/70	1,667
20C	6/12/70	4,667
20D	6/29/70	5,667
21	3/ 7/69	8,667
21	6/29/70	6,667
22	3/ 7/69	5,334
22	6/21/70	6,334

$\underline{2}X$ = 75,008
$\bar{X}$ = 4,688
N = 16

Plankton Population - Opossum Creek

Station	Date	Population (Plankters per liter)
51A	3/ 5/69	667
51	5/13/68	1,334
51A	5/13/68	667

$\underline{2}X$ = 2,668
$\bar{X}$ = 889
N = 3

Plankton Population - Hog Creek

Station	Date	Population (Plankters per liter)
23	8/22/67	6,667
23	8/29/68	4,334
23	3/ 7/69	7,334
23	6/21/70	4,667

$2X = 23,002$

$\bar{X} = 5,751$

Plankton Population - Hurricane Creek - West Branch

Station	Date	Population (Plankters per liter)
48	9/19/67	5,667
48	7/ 8/68	5,667
48	8/ 8/68	5,334
48	3/ 5/69	6,667

$2X = 23,335$
$\bar{X} = 5,834$

Plankton Population - Hurricane Creek - East Branch

Station	Date	Population (Plankters per liter)
57	9/25/67	3,334
57	7/11/68	3,667
58	3/ 5/69	3,334

$2X = 10,335$

$\bar{X} = 3,445$

Plankton Population - Indian Creek

Station	Date	Population (Plankters per liter)
9	8/18/67	8,667
9A	6/24/68	5,667
9B	7/ 1/68	2,334
9	7/1/ 68	4,334
9	3/17/69	1,334
9A	7/1 /69	6,334
9A	3/17/69	1,334
9B	7/ 1/69	2,667
	7/ 1/69	5,667

$2X = 38,338$

$\overline{X} = 4,260$

Plankton Population - Kaskaskia River

Station	Date	Population (Plankters per liter)
2	8/14/67	6,667
2B	8/28/67	13,334
2	8/28/68	6,334
2C	8/26/68	8,667
2D	8/26/68	11,334
2	3/ 6/69	7,334
2C	8/25/69	14,334
2D	3/ 6/69	12,667

$\underline{2}X = 80,671$

$\overline{X} = 10,084$

Plankton Population - Flat Branch

Station	Date	Population (Plankters per liter)
69	10/4/67	3,334
70	10/4/67	2,667
71	10/4/67	2,334
71	8/28/68	3,334
69	3/ 6/69	1,667
70	3/ 6/69	1,667
71	3/ 6/69	2,334

$2X = 17,337$

$\overline{X} = 2,477$

Plankton Population - Flat Branch

Station	Date	Population (Plankters per liter)
62A	3/ 6/69	667
62	8/19/69	2,334
62A	6/28/70	667
62	6/28/70	1,334

$2X = 5,002$

$\bar{X} = 1,251$

Plankton Population - Clear Creek

Station	Date	Population (Plankters per liter)
65	10/2/67	1,334
65	8/27/68	1,667
65	3/ 6/69	1,667

$2X = 4,668$

$\bar{X} = 1,556$

Plankton Population - Crabapple Creek

Station	Date	Population (Plankters per liter)
68A	8/ 8/68	5,667
68B	8/ 8/68	6,667
68A	9/26/68	6,667
68B	9/26/68	6,333
68A	8/25/69	8,334
68B	3/ 6/69	7,334

$2X = 41,002$

$\bar{X} = 6,834$

Plankton Population - Little Wabash

Station	Date	Population (Plankters per liter)
64	10/2/67	2,662
64	8/27/67	3,667
64A	8/27/68	4,667
64B	8/28/68	6,334
64B	3/ 6/69	7,334
64A	7/18/70	5,334

$2X = 29,998$

$\overline{X} = 5,000$

$2X = 1.503,973$

$\overline{X} = 7,752$

$N = 194$

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